

**Transportation Master Plan
For The Greater Texas Medical Center Area**

Technical Memorandum 5

Analyze and Evaluate Options

Prepared for

The City of Houston

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1. INTRODUCTION

Technical Memorandum 4 described the overall mobility improvement strategies for the Greater Texas Medical Center Area. It described the improvement options that were developed and considered as part of the mobility improvement strategies. The purpose of this technical memorandum is to describe the evaluation process, the findings from the evaluation, and the proposed long-range strategies and short-range projects.

2. REVIEWS WITH COMMITTEES AND PUBLIC FORUM

The study management team is comprised of a two-level advisory committee structure: a Steering Committee to provide overall guidance for the study and a Technical Committee to address the more technical aspects of the project and to make recommendations to the Steering Committee. An additional function of these committees is to keep their respective constituents informed regarding the progress and findings of the project and to report back on any inputs from their constituents. To date the Technical Committee has met seven times and the Steering Committee four times. Included in Appendix A is a list of the Steering and Technical Committee Members.

In addition to the official committee structure, the Steering Committee also decided to have two Community Forum Meetings. Members of area stakeholder groups were invited to the meetings, which were also open to the public. The intention was to inform the affected communities about the project, to answer questions they had, and to obtain input regarding their suggestions and issues.

The first meeting was held on July 8, 2002 with approximately 230 people attending. The purpose of this meeting was to inform the public about the project, obtain their input, and to introduce the three proposed strategies. It was decided by the Steering Committee to have a follow-up Community Forum Meeting. The purpose of this meeting was to inform the public about the evaluation of the various strategies and the proposed short-range projects and long-term strategies. This meeting was held on July 30, 2002 and was attended by approximately 150 people.

2.1 Issues Raised at the First Public Forum Meeting:

The following key issues were raised and discussed during the first and second public forum meetings, respectively:

- affects of widening Greenbriar on adjacent residents,
- various pros and cons of the various Bayou crossing options,
- inconvenience to be expected during construction of the various projects,
- need for drainage improvements along with roadway improvements,
- need for better traffic circulation,
- speeding traffic in residential neighborhoods causing safety hazards,
- desire for improved transit services,

- desires to improve bicycle and pedestrian environments,
- need for additional remote parking and shuttle services,
- relocation of MacGregor closer to Brays Bayou to expand usable Hermann Park land,
- cost implications of the various alternatives,
- emergency access during flooding,
- parking for peak event days,
- ways to anticipate and manage future growth in the area, and
- ways to reduce vehicular travel.

2.2 Issues Raised at the Second Public Forum Meeting:

- safety of driveway access for the option using existing Cambridge alignment,
- pedestrian safety associated with Cambridge improvements,
- possible decline of property values if widening option is selected for Cambridge,
- possible flooding that might result of Brays Bayou crossings options,
- delicate environments of the Hospice and Ronald McDonald House,
- variety of comments stating various Brays Bayou crossing alternatives being better than others,
- support to extend Bertner and to link it with Knight for north-south access to IH-610,
- safety concerns regarding Holcombe,
- concern about losing Holcombe's landscaped median,
- need to improve Sunset-Rice intersection,
- sidewalks along Main needing improvement,
- protection of trees in the study area, and
- need for increased police patrols to protect pedestrians and bicyclists.

The study team carefully considered the comments from the public forum meetings and the technical and steering committee meetings. The input assisted in the selection of the alternatives to be selected for evaluation as well as the evaluation process itself.

3. EVALUATION OF OVERALL STRATEGIES

The three overall strategies – network improvements, system connectivity, and operational improvements (see Technical Memorandum 4 for a detailed descriptions) – were evaluated to assist with the selection of the long-range strategy and short-range projects. The following sections discuss the evaluation criteria used and the evaluation process followed.

3.1 Evaluation Criteria and Measures

The seven overall objectives that have been established early in the study were used as basis for evaluating the three strategies. A single measure, or at the most two measures, was selected to measure the performance of each of the objectives for each of the strategies. A base case was also developed to serve as a benchmark for evaluating the three strategies. The base case was based on a transportation network that comprised of only existing facilities and committed projects. Table 1 contains a list of the study objectives and the corresponding criteria selected to measure the objectives.

Table 1
Objectives and Criteria Used for Evaluation

Objectives	Criteria
Improve access to trauma centers, major activity areas, and redevelopment areas.	Peak hour intersection delay reduced at the major intersections.
Improve activity area and redevelopment area circulation by all modes of transportation.	For collectors and arterials, the number of additional blocks that are less than 7,000 feet in length (1/3 mile square).
Increase activity center parking in accordance with demand, and locate major parking facilities on approach routes.	Percent of activity area parking demand for which parking is provided along approach routes.
Balance the transportation system to reduce dependence on personal motor vehicle travel.	Percentage of transit vehicles (or passengers) entering the major intersections at LOS D or better. Percentage of bike route miles not on designated major thoroughfares.
Enhance neighborhood character and conditions and local area cultural, educational, and recreational amenities through improved transportation services.	Daily vehicle miles of residential and park frontage on one or both sides of collectors and arterials.
Provide emergency access during flood conditions and develop transportation improvements associated with flood remediation projects.	Miles of key routes providing emergency access to the TMC that are not in the 100-year flood plain.
Use available transportation resources effectively and efficiently.	Roadway improvement cost per estimated person hours of delay reduced (transit and automobiles).

3.2 Evaluation Process

This section discusses how each of the criteria was measured as well as the results from the calculations.

Peak Hour Intersection Delay Reduced

An important factor in calculating the criteria values was the intersection delays and levels of service (LOS). For this purpose, the 2025 traffic projections of the Houston-Galveston Area Council (HGAC) were used as starting point. Traffic counts by the City of Houston, Texas Transportation Institute, consulting firms, and other sources were used to augment these counts for roads that were not covered by the HGAC projections. These volumes, projected to the year 2025 and assigned to the existing and committed roadways, constituted the base case volumes. For the three area strategies under consideration, separate traffic assignments were performed to allocate traffic volumes on the proposed networks.

The major intersections were then analyzed to determine their LOS ratings and approach delays as well as the overall intersection delays and LOS. This was accomplished by determining the approach volume-to-capacity ratios (V/C). The capacities were determined for various roadway types and were based on HGAC's suggested capacity values as contained in their 2020 Strategic Plan (1). The V/C ratios were then converted to LOS estimates based on Circular 212 of the Transportation Research Board (2). The 1997 version of the *Highway Capacity Manual* was then used to convert the LOS estimates to average delay per vehicle (3). The approach and total intersection delay was then calculated by incorporating the approach volumes and by calculating the critical approach V/C ratios.

By considering transit volumes (bus and LRT) as well as the average occupancy rates for automobiles and transit vehicles, person delays were also determined. Appendix B contains tables that show a summary of the intersection delay and LOS values for the three strategies and the base case.

It should be noted that freeway interchanges were not evaluated as part of this analysis because the freeway improvements are common to all the alternatives.

Additional Blocks Less Than 7,000 Feet Perimeter

Long travel paths can result when blocks that are bounded by arterial and major collector streets become excessively large. Undesirable cut-through traffic patterns often occur under these conditions. For the purposes of this study, block size was expressed in terms of the perimeter of the block created by arterials and major collector streets.

Strategy 1, Network improvement, creates the smallest number of new blocks with perimeters less than 7,000 feet (only one). This is expected because this strategy concentrates on improvements to existing routes rather than providing new ones. Strategy 2, Connectivity, creates 18 additional blocks of the more desirable size. Strategy 3, Operational Improvements, results in only 3 additional 7,000 feet or less blocks. This is also expected because the strategy optimizes the existing system with little emphasis on new routes. Table 2 provides information on the additional blocks by strategy.

Table 2
Number of Additional Blocks Less Than 7,000 Feet

Strategy	Additional Block #	Roadway Boundaries			
		North	South	East	West
Strategy 1	1	MacGregor	Holcombe	Cambridge	MacGregor
	1	University	Holcombe	Main	Travis
	2	MacGregor	Dixie	Alameda	MacGregor
	3	MacGregor	Dixie	Grand	Alameda
	4	South Fwy	Dixie	South Fwy	Grand
	5	Dixie	Holcombe	Grand	Alameda
	6	Dixie	Holcombe	South Fwy	Grand
	7	Holcombe	OST	Grand	Alameda
Strategy 2	8	Holcombe	South Fwy	OST	Grand
	9	OST	La Concha	Cambridge	Cecil
	10	La Concha	El Paseo	Alameda	Cambridge
	11	La Concha	El Paseo	Cambridge	Fannin/Cecil
	12	La Concha	Murworth	Kirby	La Concha
	13	Murworth	South Loop	Kirby	La Concha
	14	El Paseo	Hollyhall	Cambridge	Knight
	15	El Paseo	Hollyhall	Alameda	Cambridge
	16	El Camino	Hollyhall	El Rio	Alameda
Strategy 3	17	El Camino	Hollyhall	El Camino	El Rio
	18	Hollyhall	South Loop	El Rio	Alameda
	1	MacGregor	Dixie	Grand	Alameda
	2	South Fwy	Dixie	South Fwy	Grand
Strategy 3	3	OST/Main	Mac Nee	Kirby	OST

Parking Along Approach Routes

There are approximately 48,000 existing parking spaces, which includes the TMC main campus, Hermann Park, Reliant Park, and the Museum District. With an expansion of over 7 million square feet of floor space, at a rate of 1.8 spaces per 1,000 square feet, the TMC area alone will need to provide for an additional 12,600 parking spaces.

One of the guiding principles for parking is to locate it on major approach routes. This criterion was used to evaluate the effectiveness of the various strategies in terms of potential parking provision. The proposed garage locations indicated in this memorandum are approximate, whereas the exact locations should be determined at the site planning level. For evaluation purposes, the Texas Medical Center was divided into 10 sections based on roadways traveling through the site as well as institutions sharing similar areas. Sections 1 through 5 consist of the TMC central campus, other sections include the Leland Anderson Campus located east of SH 288, the museum district, Herman Park area, Rice University, and remote areas located south of Brays Bayou and east of Braeswood Boulevard.

For each of the TMC sections an inventory of existing parking was conducted. The percentage of existing parking spaces along the major approach routes to and from the TMC was also calculated. Appendix C contains figures displaying the locations of the various sections and six potential garage locations. Appendix C also shows the number of existing spaces as well as the number of spaces on major approach routes in tabular format.

It was found that only Section 3 has less than 50 percent of its parking provided along major approach routes.

The following actions are suggested to improve area parking:

- Investigate the conversion of several surface lots to parking garages to meet local demands.
- Consider creation of a parking authority or management district to provide additional parking where existing entities cannot meet evolving demands; this new entity should facilitate shared parking to enable institutions and others to meet peak demands that are offset from those of other users. It may also need a parking revenue control system to increase efficiency of use of available parking.
- Develop a wayfinding system for the TMC and surrounding areas (could be tied to the parking control system).

Transit Vehicles Entering Intersection at LOS D or Better

The number of peak-hour buses entering each intersection at LOS D or better was determined from volumes included in METRO's 2004 LRT Operating Plan and the intersections identified to be operating at LOS D or better. Volumes were then increased by 2% per year through 2025 to translate 2004 volumes to 2025 volumes (assuming that the anticipated 50 percent growth in TMC employment would be accompanied by a 50 percent increase in transit ridership and service). Based on the traffic analysis, the number of peak-hour buses entering the intersections at LOS D or better was then identified. Based on typical passenger loads and expected ridership on the routes, these transit vehicle volumes were translated into peak-hour passenger volumes through each intersection. Since LRT trains are expected to have signal priority, the comparative congestion on the roadway system across strategies was assumed not to affect LRT travel times.

The transit portion of the comparative analysis of the strategies involved an analysis of the effect of each strategy on METRO's 2004 transit network rather than an analysis of different transit strategies. For Strategy 1, transit passengers would benefit from reduced delays primarily along Holcombe, Old Spanish Trail, and Holly Hall. For Strategy 2, transit passengers would benefit from reduced delays primarily along Greenbriar, Old Spanish Trail, and Braeswood. For Strategy 3, improvements for transit passengers would be primarily on McGregor Way, University, and Braeswood. In general, transit vehicles are operating on the same congested roadways as personal vehicles. Therefore, where general traffic improves, transit operations improve as well.

Table 3 summarizes the results of the transit analysis by presenting the percentages of total TMC-area transit passengers entering intersections with unacceptable levels of service (LOS E or LOS F).

Table 3
Percentage Transit Vehicles Entering Intersections at LOS E or Worse

Strategy	Percentage at LOS E	Percentage at LOS F	Percentage at Total – E & F
Base case	19%	36%	55%
Strategy 1	17%	16%	33%
Strategy 2	15%	28%	43%
Strategy 3	17%	23%	40%

The best strategy, Strategy 1, decreases the percentage of transit passengers facing unacceptable levels of service from 55% to 33%. Strategy 3 reduces the percentages of passengers facing unacceptable levels of service to 40%, while Strategy 2 reduces that figure to 43%.

Bicycle Route Miles Not on Designated Thoroughfares

Bicycle Master Plan

The bicycle master plan for the TMC and surrounding area is a combination of the City of Houston bicycle master plan and projects deemed to be necessary to complete the bicycle network for the study area. Figure 1 shows the existing and proposed parking facilities as well as the bicycle routes proposed by the City and this study.



Figure 1. Existing and proposed parking facilities and proposed bicycle routes.

The initial evaluation measure, bike route-miles not on designated thoroughfares, was abandoned for a more comprehensive evaluation of the proposed bikeways within the TMC. For evaluation purposes, a set of measures was developed to help select the best bicycle corridors for the entire study area. The following measures used:

- **Volume**
Those segments that have volumes equal or greater than 24,000 received 0 points
Segments with volumes over 12,000 and under 24,000 received 5 points
Segments with volumes less than or equal to 12,000 received 10 points
- **Connectivity**
Projects connecting bicyclists to residential, park, or schools received 10 points
Projects connecting to other trails or bicycle lanes received 10 points
Projects connecting to sidewalks received 5 points
No connection 0 points
- **Area Type**
Projects adjacent to residential, park, and school uses received 10 points
Projects in other areas received 0 points
- **Ease of Implementation**
The following describes the allocation of points:

Existing - Shared Lane	Already constructed	10 Points
Existing - Bike Lane	Already constructed	10 Points
Existing - Multiuse Trail	Already constructed	10 Points
Proposed - Shared Lane	Signing needed (no construction necessary)	8 Points
Proposed - Bike Lane	Signing and marking needed (no construction necessary)	5 Points
Proposed – Multi-use Trail	Requires construction and signing	0 Points

The tables contained in Appendix D display the various existing and proposed bikeways located in the TMC area as well as their rating for each of the criteria. All three strategies produced similar results and the findings can be summarized as follows:

- Bikeways scoring the highest for all strategies are those along:
 - Greenbriar,
 - Mandell,
 - Rice,
 - Bolsvet,
 - Kent,
 - Golf Course Drive,
 - Caroline,
 - Swift, and
 - Brays Bayou.

Residential and Park Frontage on Arterials and Collectors

It is desirable in transportation planning to minimize the impact of traffic on sensitive land uses such as residential and parks. The following methodology was used to measure these impacts.

First the length of arterials and major collector roadways with residential and park frontage was measured. For each segment, the length was multiplied by the annual average daily traffic (AADT), resulting in annual average vehicle-miles fronting on these two land uses. These values were computed for the three strategies, taking into account the mileage and traffic volume variations. This methodology revealed only modest variations in VMT fronting on residential and park uses. The minor differences in this measure of effectiveness can be attributed to the built out nature of the study area; the limited number of new routes proposed; and the fact that much of the existing parks already front on arterial streets.

Table 4 shows a summary of the residential and park frontage, whereas a detailed table showing the residential and park frontage for the existing and proposed thoroughfares and major collectors is provided in Appendix E.

Table 4
Residential and Park Frontage in Total Daily Vehicle-Miles Traveled

Strategy	Residential Frontage	Park Frontage	Total Residential and Park
Base case	333,845	161,856	495,701
Strategy 1	322,595	151,004	473,598
Strategy 2	316,667	159,981	476,648
Strategy 3	303,049	163,580	466,629

Key Routes not in 100-Year Flood Plain

An original goal of the study was to investigate raising key routes to elevations above the 100-year flood plain. This is, however, not a fully achievable goal and reasonable alternatives are available. Storm sewer capacity, and not rising water from Brays Bayou, is the cause of most of the flooding in the study area. In addition, streets are designed to be part of the drainage system for two-year and more intense rainfall events. Thus, streets are flooded far more frequently than the occurrence of 100-year events, albeit usually for brief periods. While it is conceivable that existing streets could be raised to “high and dry” elevations, it could only be done at a very high cost and major impact on abutting properties.

Figure 2 shows the key emergency access routes to the study area. It may be noticed in this figure that there are key routes identified from each of the major directions. In practice, however, emergency vehicles might follow other routes, depending on the prevailing circumstances.

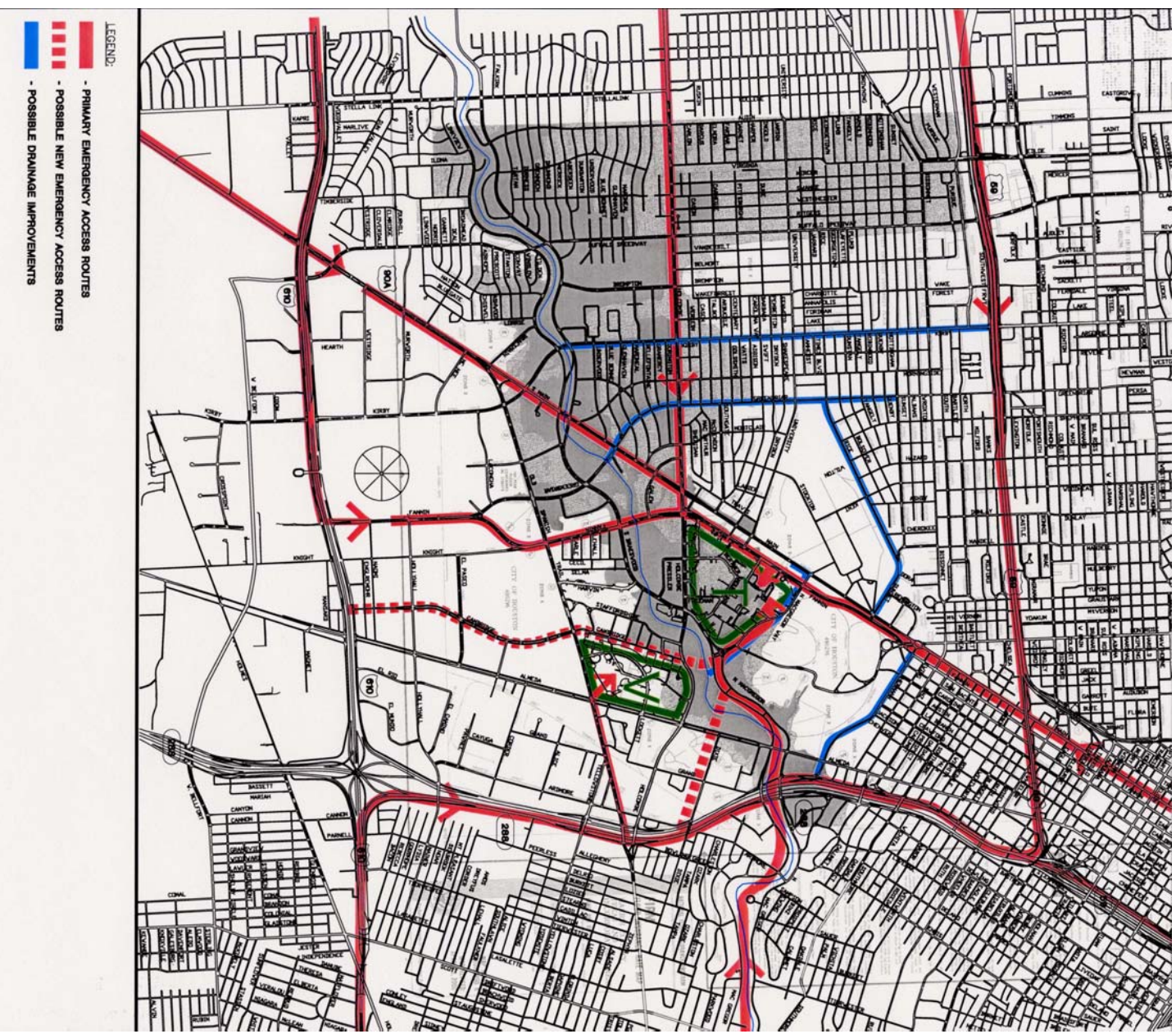


Figure 2. TMC Key Emergency Routes

Improvement Cost Per Delay Reduced

This measure considers to what extent available transportation resources are used effectively and efficiently. Specifically, it measures the ratio between improvement cost and the amount of person hours of delay reduced. The person hours of delay reduced for each of the strategies were calculated for the delay reduction criterion discussed above. The costs of the various strategies were estimated based on similar projects that were implemented in the Houston area in the past.

Table 5 shows a summary of the cost estimates for the three strategies. Appendix F contains the detailed cost estimates for the individual projects. It may be seen in this table that the cost to reduce a person hour of delay during the peak hour is almost identical for Strategies 1 and 3 at but more than twice as expensive for Strategy 2.










Table 5
Cost Estimates for the Three Strategies (Millions)



Strategy	Common Projects	Unique Projects	Total Cost
Strategy 1	\$116.1	\$81.6	\$197.7
Strategy 2	\$116.1	\$229.9	\$346.0
Strategy 3	\$116.1	\$87.5	\$203.6

3.3 Overall Evaluation Results

As discussed above, the criteria values were determined for the three strategies relative to the base case. The findings are shown schematically in Table 6. The table shows that Strategies 1 and 3 perform best for five out of the six criteria. Only in the case of “additional blocks that are less than 7,000 feet” does Strategy 2 perform best. It may also be noticed that for the remaining cases where Strategies 1 and 3 perform best, the results are fairly similar, indicating similar performance of the two strategies.

Table 6
Overall Evaluation Results

Objectives and Criteria	Option 1	Option 2	Option 3
Improve access (Peak hour intersection delay reduced)			
Improve activity area circulation (Additional blocks less than 7,000 ft)			
Increase parking according to demand (% Parking demand provided along approach routes)	All strategies similar		
Balance transportation system (% Transit entering at LOS D or better)			
(Bikeway evaluation - total possible score = 1520)			
Enhance neighborhood character (VMT at residential and park frontage)			
Emergency access during flood conditions (Miles of key routes above 100-yr flood plain)	All strategies the similar		
Use transportation resources effectively (Improvement cost index/delay reduced)			

Where:  Poorest possible rating
 Best possible rating

It can be concluded from this analysis that Strategies 1 and 3 appear to be more effective than Strategy 2, although all three offer significant improvements. Also, Strategies 1 and 3 perform very similarly, which makes it difficult to select the optimum strategy between these two. Instead, it was decided to develop a further improved strategy based on the best attributes contained in the three strategies.

It was evident from the analysis that there is a need for four additional lanes of east-west capacity, especially from the TMC area and south. There is also a need for four to six lanes of additional north-south capacity accessing with IH-610. The following is a summary of specific findings and observations during the analysis.

Transit Effectiveness

The changes suggested in Strategy 2 do not affect transit routes because new roadways do not have any bus routes under the existing LRT Transit Plan. Although travel times may improve as a result of street improvements, widening streets or increasing traffic speeds may create environments that are hostile to pedestrians and therefore may discourage transit use. Transit ridership is heavily dependant upon land uses; more intense land use and mixed-use developments will encourage transit ridership. Encouraging the separation of pedestrian infrastructure and automobile infrastructure can have negative impacts for bus riders if the separation makes it more difficult to reach bus stops

Bicycles and Pedestrian Effectiveness

After a thorough investigation of the existing pedestrian facilities, sidewalks and pedestrian crossings exist throughout the study area. There are, however, opportunities for improvements to the pedestrian network at several intersections and also at SH 288. As a general rule, all existing and future roadways within the TMC area where pedestrian traffic is expected should provide a walking area separated from vehicle travel lanes to ensure safety and provide for increased mobility. The following list the short and long-term pedestrian projects:

Road System Effectiveness

Circulation within the study area appears to be satisfactory, provided localized access is improved. Access to and from the study area is tied to freeway access and particularly from IH-610, SH 288, and US-59. The following are specific considerations regarding accessibility from the various directions:

To and from the southwest via IH-610

- Access is generally not sufficient.
- There is a need for more north-south access capacity:
 - Knight is underutilized, but currently there is no underpass at IH-610,
 - Cambridge is underutilized, but currently there is no underpass at IH-610,
 - Alameda is underutilized due to the fact that there is no ramp access to and from the east, and
 - to make the underpasses and new ramps possible, it is necessary to raise IH-610.

To and from the south and east via IH-610 and SH 288

- Access is generally not sufficient, especially serving the southeast portion of the study area.
- There is a need for more north-south access capacity to IH-610 as discussed above.
- There is a need for more east-west access and ramp capacity to SH 288:
 - Holly Hall is underutilized but there are no ramps to and from the south and east,
 - A Dixie extension to MacGregor is proposed as one Brays Bayou crossing option, but there are no frontage roads or ramp access to SH 288, and

- MacGregor is needed for traffic to and from the north and west. It is possible to improve MacGregor/SH 288 interchange as part of Brays Bayou bridge reconstruction.

To and from the southwest, west, and north via US 59 and SH 288

- It is important not to encourage more traffic to use Shepherd-Greenbriar.
- Main and Fannin are limited by US 59 ramp capacity.
- Additional capacity is possible via MacGregor and Dixie. For this to be feasible, Dixie needs to be provided access to SH 288.

4. PREFERRED LONG-RANGE STRATEGY

It was evident from the above-mentioned analysis and discussions that the ability of projects to reduce delay is a very important factor in the overall evaluation. By looking at the intersection delay reduced by the various strategies, it was possible to isolate projects that contributed considerably to delay reduction. These projects, along with others that contribute significantly to the evaluation criteria were selected from each strategy and combined to develop the preferred strategy. The following is a discussion on the selection of the preferred strategy:

4.1 North-South Direction

- The proposed widening of Greenbriar does little that intersection improvements along Greenbriar will not also accomplish if they are made throughout the same section.
- Another Brays Bayou crossing is needed; it must provide a convenient connection to IH-610 or SH 288 to have the desired benefit.
- For a new Brays bayou crossing, the Cambridge options are more effective than the Dixie extension due to the proximity to demand at the Cambridge options. However, both Cambridge and Dixie pass through sensitive areas; either would require more detailed alignment and design concept development to assess the compatibility factors.
- For Knight to be fully effective as a reliever for Fannin and Kirby, its connection to the Bertner extension needs to provide for smooth north-south movement.
- The proposed freeway improvements along SH-288 are needed.
- Better use of the available capacity along Alameda should be explored as part of the TxDOT SH-288 MIS.

4.2 East-West Direction

- Holcombe must have additional capacity to cope with the large east-west demand. Two options were considered: Widening to eight-lanes divided with left-turn lanes, *or* Holcombe-Pressler one-way pair with four lanes in each direction plus eastbound bus service on south side of Holcombe. An assessment revealed that the one-way pair option has too many negative impacts and was ultimately discarded. It was suggested after the evaluation that making greater use of Bates and Shamrock-Galen-Pressler might be an additional alternative. This should be examined as corridor improvements are detailed.
- The extension of West Belfort from Buffalo Speedway to Stella Link is needed to provide east-west thoroughfare continuity; there are no continuous east-west arterials that serve the study area south of Holcombe-Bellaire.
- The proposed Old Spanish Trail-Braeswood “connector” would do little to alleviate the need for either the Holcombe improvement or the need for West Belfort continuity.
- The Holly Hall reversible operation is of little value without ramps to and from SH 288 south and IH-610 east.
- The proposed freeway improvements along IH-610 are needed.

4.3 Other Initiatives

- Not all the intersection improvements proposed in Strategy 3 are needed to achieve target levels of service. There are approximately 30 intersection improvements needed to provide at least minimum LOS. These improvements would be more effective if they are throughout extended sections.
- Travel demand management actions are needed. The following is a list of possible strategies that may be followed:
 - More residential developments to house area employees. These developments should be priced to serve area employees and located so they are either within walkable distance from the employment opportunities or serviceable by transit.
 - Commercial development should be of types that focus on supporting area uses rather than those outside the area.
 - Spread area travel demand peaks. This can be achieved by using techniques such as flexitime, staggered work schedules, compressed work weeks, etc. This approach can be followed by major employers in the study area. Reliant Park can, for example, schedule their event start and end times to not coincide with peaks in the adjacent network.
 - Concentrate TMC facilities in specific areas to increase compactness to minimize mid-shift vehicular movement and to facilitate walking.
- Implement parking strategies to provide parking on the periphery rather than remote or in the middle of the developments and to use shared parking to meet peak event and other demand peaks. A private or area “parking authority” may be considered to facilitate provision of additional parking and shared parking where existing entities cannot do so effectively.
- Use access management to preserve available capacity and to avoid driveway-associated congestion.

It should be noted that it is advisable to also consider projects that will be needed in the long range. These projects need to be defined in more detail so they can appear on agency improvement plans and programs and so appropriate right-of-way can be reserved. Projects falling into this category are mostly the network connectivity options included in Strategy 2. The proposed strategy is shown on Figure 3.

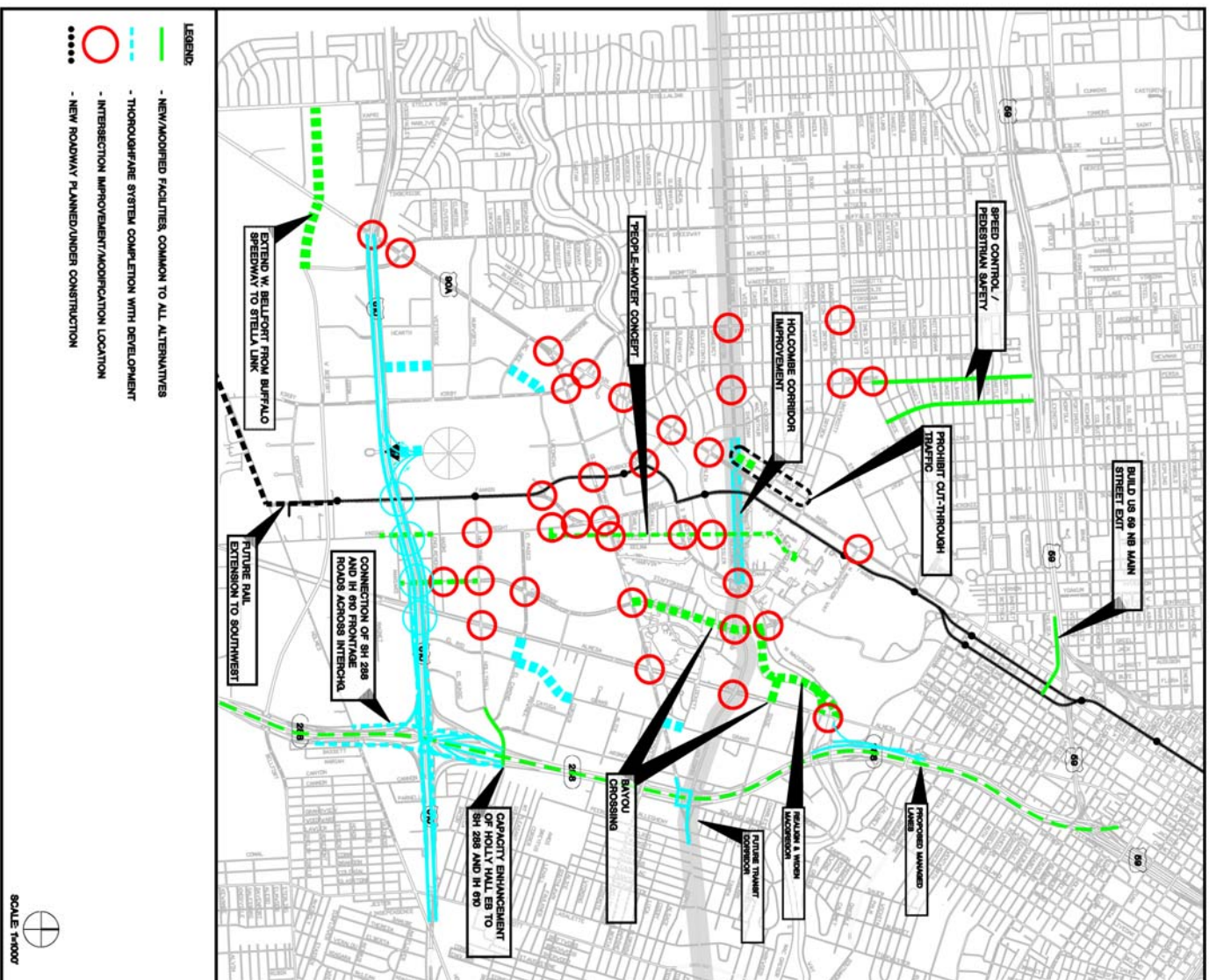


Figure 3: Proposed Strategy

5. LONG-RANGE PROJECTS AND SHORT RANGE ACTIONS

The overall goal identified through the study work effort was to meet mobility needs of the study area so projected land use development can be achieved. The study efforts determined that this

can be achieved through implementation of a combination of strategies in a coordinated approach comprising:

- multimodal supply side improvements,
- travel demand action to reduce and manage vehicle trips, and
- land-use development policies that reduce trip demand by balancing the mix of uses or reducing the level of development density.

It should be noted that due to limited resources, existing development patterns, and a necessity to preserve an appropriate quality of life in surrounding neighborhoods, it is not possible to meet the mobility goal solely by increasing the supply of roads or transit service. A coordinated combination of supply, demand, and land-use strategies must be utilized.

5.1 Strategies

Table 7 describes improvements recommended to meet evolving transportation needs as well as to improve existing deficiencies. Improvement strategies have been grouped into four general approaches and divided into short- and long-term actions. Strategies in the short-term category are intended to be undertaken in a five-to-seven year time frame while long-term actions extend beyond this short-term time period. Elements of short-term actions should be developed in a building block manner that may extend sequentially over several years and carry on into the long-term time frame to reach their full utility.

The strategies and projects recommended for this area include a combination of the following four approaches.

Policy Changes

Policy changes are intended to enable the transportation system to provide more utility and/or reduce the demand on the system. This can be accomplished through policies that lead to efficient use of resources and interaction with and among land uses to provide adequate mobility and accessibility at acceptable levels of service and acceptable business, residential, cultural, and recreational environments.

Travel Demand Reduction

Travel Demand Reduction strategies to be used to reduce the percentage of vehicle trips, especially during peak periods. This can be accomplished through actions such as remote parking facilities combined with restrictive parking policies in areas of maximum congestion, modified work schedules, employer and other incentive programs, and various other measures and incentives to increase transit, walking, and biking. The effectiveness of individual travel demand reduction actions will vary and as a result, implementation resources should be directed at those actions that have the greatest ability to reduce vehicle trips.

Transportation Operations

Transportation operations strategies will be used to increase transportation system efficiency through management and minor improvements. This can be accomplished through a number of approaches such as intelligent transportation systems, traffic management plans, improved traffic signal coordination, and intersection improvements.

Infrastructure Improvements

Infrastructure improvement strategies will be used to increase accessibility, mobility, and system capacity, including roads, transit, walking, and bicycling.

Table 7 lists the long-range strategies as well as short-range projects identified through this study.

Table 7
Candidate Short and Long Range Projects and Strategies

Project	Range	Description of Improvement
1. POLICY CHANGES Policy changes encompass actions that would enable the transportation system to achieve the greatest level of performance through enhanced planning, operations and management. Policy changes could be adopted and implemented by both public and private sector stakeholders depending upon the particular policy. Recommended policy changes would address the relationship and balance of land use and transportation mobility and define land use/development policies that would encourage more efficient development that would minimize travel demand impacts on the roadway. Policies are also identified relative to the creation of area specific organizations –Districts/Authorities that would focus on the implementation of study recommendations and become the facilitator and initiator of work efforts along with possible creation of funding resources.		
1.1 Land Use Policies		
1.1.1 Encourage mixed use complementary developments	Short and long	Develop planning and development policies and subdivision standards for the entire study area that encourage mixed-use developments that complement one another in terms of use and reduction in vehicle trips. Create policies and incentives for developments that encourage and produce complementary mixtures of appropriate housing, retail, institutional, and commercial uses.
1.1.2 Transit oriented development	Short and long	Develop planning policies and subdivision standards for the entire study area that encourage greater transit/pedestrian/bicycle utilization through safe design and accessibility to transit. Encourage design standards that require direct, convenient, attractive walking connections between buildings and sidewalks; also include bicycle parking facilities and building showers.
1.1.3 Increase development compactness and densities	Short and long	Develop planning and development policies for the entire study area that encourage greater compactness of development as well as increased densities in areas that can be served more effectively by transit facilities or that foster greater walking opportunities for many non-commute trip purposes.
1.1.4 Promote compatible residential development	Short and long	Develop planning and development policies for the entire study area to encourage more residential development to house area employees. Residential development should be located so as to encourage walk-bicycle/transit travel rather than vehicle commute trips.
1.1.5 Balance transportation infrastructure requirements with plans for additional or new land use	Short and long	Accommodating all the proposed increases in land use cannot be accommodated by the existing or proposed roadway transportation system. Ensure maintenance of achievable levels of mobility and service by requiring a traffic impact analysis needs to be conducted for all new development that would generate over 200 peak hour vehicle trips in the peak direction. This requirement would be to ensure that land development is phased with or reduced in magnitudes to match available transportation capacity.
1.1.6 Develop access management policy for the study area	Short and Long	Develop access management policy for the study area such that access to development and internal circulation is provided in a manner that maximizes the efficiency of the street system.
1.2 Parking Policies		
1.2.1 Develop Shared Parking Policy	Short and long	Create a shared parking policy so that adjacent developments can share parking facilities when their demands for parking occur at different times. Creating shared parking could reduce the overall need for parking facilities so that land and resources could be more effectively utilized.

1.2.2 Encourage peripheral & Remote Parking	Short and long	To minimize travel into the core of the study area where congestion is at its greatest, policies should be developed to locate and build peripheral and remote parking on approach routes to area activity centers. These parking facilities would be served by shuttle service that would be within up to a 15-minute ride to the final destination. These remote parking facilities would be implemented in conjunction with parking management policies to encourage their attractiveness and use.
1.3 Area Transportation Management		
1.3.1 Establish an Area Transportation Management District (TMD)	Short	Create a Transportation Management District for the area to effectively facilitate and/or manage many of the transportation programs recommended in this study. The TMD would be the facilitating and/or lead agency in bringing together various stakeholders involved in developing and implementing programs. The TMD would be an advocate for implementing programs as well as creating financial resources from non-governmental stakeholders for project financing. The TMD could also be involved in determining the benefit and need for establishing parking or redevelopment districts to better foster the achievement of transportation demands in the most effective manner.
2. TRAVEL DEMAND REDUCTION		
Travel demand reduction strategies are primarily targeted at reducing the percentage of driving trips especially during peak periods. These strategies would complement those associated with land use policies and would be directed at programs that create incentives associated with when and if a vehicle trip is made. Strategies include those associated with parking, work schedules and transit incentives.		
2.1 Management Of Travel Demand During Peaks.		
2.1.1 Employee work schedules	Short	Develop a program that encourages employers to adopt actions that reduce the need for travel to and from work during peak travel periods by staggering work schedules, creating flextime, developing compressed work weeks and telecommuting options. Spreading the arrival and departure of employees over a greater period of time outside the peak AM/PM commuter times can significantly reduce congestion and more effectively utilize street capacity.
2.1.2 Scheduling of special events	Short and long	Many of the stakeholders in the area have numerous special events that could be scheduled so arrivals and departures do not coincide with normal rush hour peaks. Additionally, special events should be scheduled so that they do not conflict with other major or adjacent special events. For very large events, consider scheduling after –event activities to slow outbound peaks (e.g., fireworks, mini-concerts).
2.1.3 Promote non-driving modes	Short and long	Promote use of transit, walking, and biking, for short trips plus long trips where transit is available. Provide incentives such as employee transportation allowances, on-site showers and lockers, flexible schedules, organization vehicles for necessary mid-day driving for work purposes, guaranteed rides home, etc. Avoid subsidized onsite employee parking. Offer patrons free bus passes in lieu of parking validations. Develop or adapt other similar measures to promote non-driving travel.
2.2 Transit Incentives		
2.2.1 Provide direct financial incentives to encourage transit use	Short	Develop an aggressive transit fare subsidy program by area employers that pays a portion or total cost of the fare for employees. This program has worked effectively for some employers in the TMC and should be expanded to other Transit incentives such as free transit passes in lieu of parking validations should also be extended to visitors for many area developments to encourage transit and eliminate vehicle trips.
2.3 Ride Share Programs	Short	Promote and facilitate the use of carpooling and vanpooling through program development, financial incentives and parking priorities. Provide rideshare matching and actively promote such programs both areawide and within each organization of more than 100 employees.

2.4 Parking Management Policies	Short	Develop parking policies that manage the availability of parking so that vehicle trips are minimized, especially in the core area of the Texas Medical Center. Policies could include pricing that encourages carpooling/vanpooling, pricing that encourages use of remote lots outside congested core areas, and pricing that encourages arrival outside peak commuting periods.
3. TRANSPORTATION OPERATIONS Transportation Operations strategies are intended to increase the efficiency of the existing system through better management and minor improvements. Improvements would be applied to both the street and transit systems and include actions such as traffic signal timing and operations, transit route adjustments and operating policies, traveler information and way-finding signage, and application of intelligent transportation systems technologies to expand capabilities and reliability. In general, operations strategies are short-term actions that can be continued over time.		
3.1 Traffic Signal Operations		
3.1.1 Traffic signal timing coordination	Short	Retime traffic signals on intervals of approximately three years or in response to major land use changes so coordination is optimal between signals and so individual intersection timing is updated to respond to current traffic demands.
3.1.2 Manage operating speeds – Shepherd/Greenbriar	Short	Along Shepherd, Greenbriar and possibly MacGregor Drive, develop alternative strategies to manage travel speeds to coincide with speeds in the 25 – 30 mph range Strategies could include such items as traffic signal timing, signage, and vegetation planting.
3.1.3 Review traffic signal operations	Shore	Evaluate in detail the current operating conditions at intersections relative to signal phasing, especially left-turn modifications to existing left-turn phasing (e.g., from protected only to permissive/protected); this change could improve operations significantly.
3.2 Traveler Information		
3.2.1 Wayfinding sign improvements	Short	Develop a comprehensive and combined way-finding sign system directing travelers by vehicle and by foot or bike to principal destinations in the study area so that consistent and comprehensible signage is presented to travelers. Currently many stakeholders have their own way-finding signage to direct users to various locations. Creating a standard format would be more comprehensible and useful to users and eliminate many duplicate signs. Better guide signage would minimize driver confusion and provide the most appropriate travel route that minimizes travel paths and congestion.
3.2.2 Pre-advance trip information system	Short	Develop a comprehensive traveler information program that provides visitors with specific trip instructions and routes prior to starting their trip. Most visitors are unfamiliar with the location of buildings and parking facilities and, in most cases, travel on major routes that are most congested in order not to become lost. Developing pre-trip routes that utilize non-congested street segments can significantly improve congestion and minimize vehicle circulating because they are lost. This pre-trip traveler information would be most beneficial for medical trips and to the Rice campus where parking locations differ from the ultimate building location. Pre-trip directions are currently a part of purchasing parking passes at Reliant Park in association with football events. Provide this information from an area website, individual institutions, or possibly TranStar's website.
3.3 Ramp Metering Operations		
3.3.1 Implement ramp metering and update timing at existing locations	Short	To better manage operations along freeway corridors, implement ramp metering or update ramp signal timing all entrance ramps serving the study area to maintain better levels of service (Level of Service D) on area freeways.
3.4 Reversible Lanes		

3.4.1 Use reversible lanes to increase roadway capacity for unbalanced flow	Short	Evaluate and implement temporary reversible travel lanes on arterial streets to accommodate heavy peak direction flows where appropriate. Applications would be associated primarily with special events for both inbound and outbound traffic conditions. Examples would be events at Reliant Park, Rice University and Hermann Park.
3.5 Traffic Management Plans		
3.5.1 Develop traffic management plan	Short	Traffic Management Plans should be developed for a variety of conditions so that trip activities are better planned and managed. Conditions that would require Traffic Management Plans include major special or reoccurring events, peak periods in highly congested area, roadway construction or maintenance projects, or situations where lane closures may significantly impact vehicle and transit operations.
3.5.2 Hermann Park traffic operations plan		Analyze and develop traffic operations plan for Hermann Park events that effectively manage traffic flow and provide advance information relative to routes, parking, and special event shuttle service.
3.5.3 Binz corridor analysis	Short	Prepare traffic analysis of corridor from US-288 to Montrose to evaluate traffic signal operations and adequacy of stop sign control in managing traffic operations.
3.6 Intelligent Transportation Systems (ITS)		
3.6.1 Deploy intelligent transportation system	Short and long	<ul style="list-style-type: none"> • Continue the deployment of ITS throughout the study area across numerous functional applications, including: traffic signals and optimized signal timing and coordination. • Traveler information to alert motorists of congestion locations and alternative routes. • Parking management systems that provide real time parking garage and on street availability to traveling motorists. • High water warning systems that detect flooded locations and provide remote on-street information to motorists of closures and alternative routes. • Transit information that provides passenger real time bus and train arrival information at primary transit stops (transit centers) and other area building facilities.
4. INFRASTRUCTURE IMPROVEMENTS		
<p>Infrastructure improvement strategies are directed at providing additional roadway, transit, parking, and pedestrian and bicycle mobility by expanding or improving facilities. Strategies would involve the construction/development of new facilities and reconfiguration of existing facilities across all infrastructure systems in a coordinated manner so that overall system resources are maximized to the greatest level. Infrastructure implementation should be programmed and prioritized relative to the increase in mobility and cost effectiveness. Project implementation would be programmed so that individual actions are coordinated in a sequential manner that provides the greatest mobility and access benefits. Infrastructure actions include additional planning studies, project coordination efforts with non-transportation infrastructure projects, programs to preserve right-of-way and future alternative and physical infrastructure improvements.</p>		
4.1 Transit Improvements		
4.1.1 LRT shuttle service	Short	Evaluate, plan, and initiate shuttle service between the three TMC area LRT stations and major facilities in the eastern portion of the medical center. Periodically analyze need for additional shuttle service to other major area land uses. This service will increase the attractiveness of transit and in turn increase transit utilization and a corresponding decrease in vehicle trips.
4.1.2 Bus stop attractiveness	Short	Enhance both bus stops and pedestrian access routes serving major boarding points with attractive benches, shelters, landscaping, lighting, transit route information, etc. as applicable.
4.1.3 Local transit service	Short and long	Periodically evaluate opportunities to upgrade local bus service and improve connectivity to LRT and activity centers within the study area

4.1.4 Secondary park & ride service	Short	Periodically evaluate effectiveness of direct Secondary P&R service to the TMC
4.1.5 Area shuttle service	Short	<p>Periodically analyze shuttles and circulator transit services between major activity center areas, remote parking facilities and LRT stations. Creating circulator transit services can reduce the need for vehicle trips internal to the core study area for both peak and off peak periods. Initial shuttles and circulators to be initiated with LRT startup include::</p> <ul style="list-style-type: none"> • Smithlands remote parking lot internal circulator • Shuttle serving Hermann & Galen LRT stations and east side of TMC <p>Suggested areas of analysis include</p> <ul style="list-style-type: none"> • Rice Village, Rice University, TMC • TMC – Third ward
4.1.6 High capacity transit corridors	Short and long	In the short term, complete evaluation of the feasibility of developing additional high capacity transit corridors that would serve the study area. These include: US-90A, SH-288, and the Southeast Corridor. In the long term, program and initiate construction along justifiable corridors.
4.1.7 Priority transitway along Holcombe	Short	As part of establishing right-of-way requirements for the recommended Holcombe Blvd. improvement, evaluate and preserve the opportunity for development of a future priority transitway along the Holcombe corridor or alternative parallel streets – Bates & Galen/Pressler.
4.1.8 TMC intercampus people mover	Short and Long	Short term establish intercampus shuttles where needed to serve intercampus movements (e.g., Nabisco Building, biotechnology park, off-campus medical offices). Also identify right-of-way for people mover between main TMC campus and biotechnology park and preserve necessary right-of-way. Over the longer term, analyze intercampus trip movement to determine need and justification for people mover system between TMC core campus and new proposed Biotechnology Park.
4.2 Pedestrian Improvements		
4.2.1 TMC skyway pedestrian system	Short and long	Undertake planning and design analysis that defines comprehensive skyway pedestrian system for core TMC campus area, including connections to major parking facilities and transit stations and centers. Plan should address protection or separation of pedestrians and vehicular traffic at major crossing points. Initiate phased implementation and preservation of alignments in short term. Long-term complete implementation of the system.
4.2.2 Pedestrian bridges Reliant Park	Short	Complete pedestrian bridges across Kirby Drive at Reliant Park.
4.2.3 High frequency pedestrian accident locations	Short and long	Analyze locations with high frequency of pedestrian accidents to determine possible improvements to operations or intersection design. Develop phased implementation program of recommended improvements. Initial target areas include Holcombe and Fannin, Mecom Fountain near Hermann Park, Greenbriar at Rice University and Main at MacGregor.
4.2.4 Brays Bayou pedestrian corridor	Short and long	Complete Brays Bayou pedestrian/bicycle corridor improvements as part of HCFCD bayou improvement program. Provisions should be made to grade separate corridor from bridges crossing bayou, but should provide access to bridges.
4.3 Bicycle Improvements		

4.3.1 Extend and connect existing bikeway network.	Short and long	Expand existing bikeway network and city bikeway plan to service major destinations. Bikeway facilities should be provided where they can be cost effectively accommodated. Coordination should be maintained during land development to encourage off-street bike and pedestrian trails that interconnect uses. Due to constrained availability of right-of-way and its costs, bikeway implementation should be encouraged off-street where possible as land development occurs. Ensure that bikeways are located on streets that are appropriate to accommodate bicycle traffic or on off-street trails. Bike routes should be properly designated and maintained.
4.3.2 Brays Bayou bicycle corridor	Short and long	See Brays Bayou pedestrian corridor in section 4.2.
4.4 Roadway and Transit Infrastructure Improvements		
4.4.1 Intersection improvements	Short and long	<p>Numerous intersections within the study area are severe bottleneck and congestion locations. A detailed analysis of the following intersections should be undertaken to determine the benefits and feasibility of geometric improvements such as additional left and right turn lanes and other operational improvements. Improvements would be priority ranked for phased implementation. Intersection analysis would continue in a phased manner over time and as development activities occur so that most major intersections in the area are reviewed. Initial priority intersections for the first phase of analysis include:</p> <ul style="list-style-type: none"> • Fannin-Braeswood • Fannin-MacGregor • Main-MacGregor • Main-Galen • Braeswood-MacGregor • Braeswood-Pressler • Alameda-MacGregor • Alameda-Holcombe • Main-Greenbriar • Main-Braeswood • Main-Kirby • Main-Old Spanish Trail • Main-Buffalo Speedway • Kirby-Old Spanish Trail • Kirby-University • Greenbriar-Kirby • Greenbriar-University • Greenbriar-Braeswood • Greenbriar-Old Spanish Trail • Greenbriar-Fannin • Fannin-Old Spanish Trail • Fannin-Knight • Knight-Holly Hall • MacGregor Drive-MacGregor Way • Cambridge-Holcombe

		<ul style="list-style-type: none"> • Cambridge-Old Spanish Trail • Cambridge-El Paseo • Cambridge-Holly Hall • Cambridge-Naomi • Almeda-Old Spanish Trail • Almeda-Holly Hall
4.4.2 Right-of-way preservation	Short	<p>Several corridors in the study area experience current or project high demands for travel. In some locations, existing capacity is not capable of accommodating this demand and in other areas, no facilities currently exist. For each corridor, a detailed technical analysis should be undertaken to further determine the specifics of possible improvements and to determine the most appropriate alignment. As part of this analysis process, right-of-way along all possible alignments should be preserved to avoid elimination of an alternative route. The following corridors are recommended for further detailed analysis:</p> <ul style="list-style-type: none"> • La Concha: Kirby-McNee • La Concha: IH-610-Westridge • La Concha: Greenbriar-Cambridge • Grand: Lockett-Old Spanish Trail • Grand: Corder-El Camino • El Camino: Grand-Almeda • Travis: Old Main-Holcombe
4.4.2.1 Bertner – Old Spanish Trail (OST) to IH-610	Short	Bertner is currently being extended across Brays Bayou between Holcombe and OST. The extension of Bertner south to connect to existing Knight would create a Bertner-Knight continuous north/south street. A detailed alignment analysis should be performed so that ROW can be preserved and acquired as development activities occur.
4.4.2.2 Additional Brays Bayou crossing	Short	Analyze and select alignment for new Brays Bayou crossing and associated street improvements. Travel demand projections have identified the need for additional north/south roadway capacity across Brays Bayou between Braeswood and Almeda. Study efforts identified three candidate corridors for this new facility to be located: a westerly corridor in the area on the west side of Brays Bayou and Devonshire/Parkwood, a central corridor generally along existing Cambridge Street, and an easterly corridor that would connect MacGregor and Almeda via a new connection in the vicinity of Dixie and extend along the existing Dixie alignment east to SH 288 or a connection directly to Almeda at Holcombe. Initial analysis has concluded that the westerly corridor is less viable due to functional utility, costs and storm water impacts. A more detailed technical analysis should be completed of the central and east corridors to determine the most appropriate alignment so that all project impacts are evaluated. Major considerations identified include: environmental, storm water, impacts to park land and other abutting property, functional operation, right-of-way requirements, dislocations, and costs. Once the alignment is selected, prepare preliminary schematic plans to establish right-of-way needs; request approval of any needed city thoroughfare plan amendments and reserve right-of-way.

4.4.2.3 Realignment of N. MacGregor Way	Short	This recommendation, while not improving mobility unless additional travel lanes are provided, is listed as an action that may mitigate other improvements. The current alignment of N. MacGregor Way from Almeda to S. Braeswood aligns through the south portion of Hermann Park. This alignment and the wide median consume a substantial portion of land that currently is being utilized as primarily open space. Realigning N. MacGregor Way closer to Brays Bayou with a narrower median would make available as much as 80 acres west of MacGregor Way for more intense park activities. An analysis should be undertaken in conjunction with other projects that might impact park land. Implementation could be programmed if required to mitigate park impacts.
4.4.2.4 Holcombe Boulevard – Greenbriar to SH-288	Short	Holcombe is the only major continuous east/west arterial in the study area and consequently is a highly congested facility, especially through the core campus area of the TMC. Widening to 8 lanes is recommended between approximately Main and Brays Bayou. A detailed analysis should be undertaken to identify the most effective geometric configurations to improve capacity while considering safety. The analysis should consider additional intersection improvements east and west of the 8-lane section. In addition, the Bates and Galen/Pressler parallel corridors should be analyzed as possible alternatives to widening Holcombe to 8 lanes. The analysis would determine the most appropriate combination of improvements that maximize capacity improvements while minimizing impacts to abutting properties, transit operations and pedestrians.
4.4.2.5 TMC intercampus people mover	Short	As discussed in recommendation 4.1.9, an automated People Mover System should be evaluated in the Bertner corridor area. Right-of-way should be preserved for this long-term improvement. In the interim, if warranted a rubber tire shuttle service could operate between the TMC main campus and Biotechnology Park.
4.4.3 Roadway Improvements Numerous roadway improvements were identified as being beneficial to area mobility. These improvements ranged from smaller site-specific projects, construction of remaining arterial segments, to new freeway ramps and major improvements to the freeway system abutting the study area. Several recommendations were previously discussed in Section 4.4.2 Right-of-Way Preservation and could be included for further implementation in the long-term if initial alignment studies warrant further consideration. All roadway improvements should address and improve drainage within or crossing the respective road's right-of-way to meet or exceed city design standards.		
4.4.3.1 Main Street/US-59 exit ramp	Short	As part of the US-59 reconstruction project, construct a northbound exit ramp to Main Street along with intersection improvements at Main and the reconstruction of Wentworth to San Jacinto.
4.4.3.2 MacGregor Way at SH-288	Short and long	As part of Brays Bayou improvements at SH-288, reconfigure the southbound exit ramp at MacGregor to eliminate the queuing onto the freeway and increase capacity.

4.4.3.3 Freeway accessibility IH-610 – SH 288	Short and long	<p>Area accessibility from IH-610 – SH-288 should be improved through implementation of a series of improvements. Major investment studies by TxDOT or others should be undertaken. Further, more detailed study of the following is recommended. Improve area accessibility, particularly from the south along IH-610 and from the east along SH-288 (see map):</p> <ul style="list-style-type: none"> • Raise the IH-610 freeway to provide for underpasses and interchange access to and from the east for Knight, Cambridge, and Alameda. • Provide continuous frontage roads through the IH-610/SH-288 interchange • Consider a flyover or 3-level diamond IH-610 interchange serving S. Main between the north on Main and the west on IH-610. • Provide additional ramps for Holly Hall to and from SH-288 south and IH-610 east • Modify the SH-288/Yellowstone-Holcombe intersections to provide 2-phase signal operation (possibly in modified roundabout configuration) to increase capacity. • Braid SH-288 ramps between Binz and MacGregor
4.4.3.4 Additional Brays Bayou crossing	Short and long	Construct new bayou crossing and associated street improvements. . Project implementation should be phased and coordinated with other storm water and transportation improvements.
4.4.3.5 Holcombe – Greenbriar to SH-288	Long	As recommended in Section 4.4.2.4, upon completion of detailed corridor analysis, program recommended improvements in conjunction with storm water and other transportation improvements.
4.4.3.6 N. MacGregor Way – Alameda to S. Braeswood	Long	As recommended in Section 4.4.2.3, upon completion of detailed corridor analysis, program recommended improvements in conjunction with storm water and other transportation improvements.
4.4.3.7 Bellfort extension – Stella Link to Buffalo Speedway	Short	Bellfort is an east/west major arterial street south of IH-610. It is recommended that the remaining section of this facility, which is included in the City of Houston Thoroughfare Plan, be constructed between Stella Link and Buffalo Speedway. Completing the facility will provide a continuous arterial street to serve traffic in the southern study area.
4.4.3.8 Reliant Park – IH-610 on-ramp	Long	Analyze in further detail the feasibility of constructing direct on-ramp to IH-610 from Reliant Park parking facilities. Include in IH-610 improvement program if feasible.
4.4.3.9 Travis Street – Holcombe to University	Short and long	Analyze the extension of Travis Street south to Holcombe. Connecting Travis to Holcombe would provide a continuous street from University and aid in improving area circulation and the desire not to utilize local streets to the west.
4.4.4 Parking		
4.4.4.1 Peripheral and remote parking	Short and long	As recommended in Section 1.2.2, peripheral and remote parking needs to occur to reduce vehicle trips in core activity areas. Analysis should be undertaken to identify future locations for remote parking and reserve land for such use.
4.4.4.2 Parking garage design review	Short and long	As new parking garages are developed, it is recommended that a review be developed prior to construction to assess the traffic impacts of the facilities. Traffic impact studies should be performed for any garage containing 500 spaces or more. Numerous traffic considerations should be analyzed, most notably, access routes and their impact to abutting user – residential streets, valet operations, and the provision for adequate space to avoid vehicle queues onto the street.
4.4.4.3 Valet parking review	Short	Review operations/management of existing valet parking facilities to eliminate vehicle queues onto streets.
4.4.5 Planning Studies Several planning studies are recommended in addition to the previous recommended corridor analysis projects. These planning studies are directed at traffic mitigation of proposed developments, analysis of freeway improvements, and modifications to the City’s Thoroughfare Plan for additional continuous street segments in the study area.		

4.4.5.1 Southgate Area	Short	As part of the development of a new parking garage on Travis, develop a mitigation plan to protect the neighborhood from traffic spillover. Develop strategies and designs for private sector implementation that could include the extension of Travis south to Holcombe.
4.4.5.2 Major Investment Study (MIS) – SH-288	Short	Develop plan to improve access to SH 288, serving major roads in study area from South of IH-610 - North of US 59. Consider study area access, freeway throughput capacity, frontage road function and capacity, safety, and transit/HOV or other special provisions.
4.4.5.3 Major Investment Study IH-610	Short and long	Develop plans to improve access serving Knight, Cambridge and Almeda as well as Main Street, Reliant Park; address freeway throughput capacity, frontage road function and capacity, safety, and transit/HOV provisions or other special uses. From west of Main - East of SH 288.
4.4.6 Flood Control & Drainage Improvements In separate work efforts, several major projects are underway to improve storm water runoff in the study area. As these drainage improvements continue, coordination with transportation projects must be maintained relative to specific design elements and project phasing. All transportation projects must be designed to include drainage improvements that reduce street flooding and control street flow across the area. Specific consideration should be directed at the following:		
4.4.6.1 Brays Bayou bridge	Short and long	Harris County Flood Control has a current project to improve bayou conditions through channel expansion and raising the elevation of existing bridges. This work effort should be coordinated with other transportation improvements to minimize impacts during construction and ensure the design of the bridges coincide with future street design standards.
4.4.6.2 Emergency vehicle access	Short and long	Flood Control and Transportation improvement projects should be developed to provide access routes during storm conditions. Multiple access routes from various directions should be created to provide alternative paths during high water conditions. It is recognized that not all routes may be passable during high water periods, but the desire is to provide one or more alternatives that are passable in some restricted manner. While it is desirable to have high and dry access routes, the physical characteristics of the area and availability of resources make this requirement very difficult. A realistic approach is to have alternative routes that will have some level of water but will provide a reduced level of accessibility. Possible routes include: <ul style="list-style-type: none"> o Main, Fannin, and SH-288, each from the north and south o MacGregor from the east o Holcombe from the west o New bayou crossing and connection to IH-610

6. OBJECTIVE ACHIEVEMENT ANALYSIS

It is important to determine to what extent the overall objectives are addressed by the proposed strategy. A three-point scale ranging from *Greatly improves* (a significant benefit will occur) to, *Improves* (a benefit will occur), and to the lowest end of the scale, *Neutral* (remains the same) was developed. The extent to which each of the four strategies (policies, travel demand reduction, operations, and infrastructure) addresses the seven objectives was determined.

It was found that infrastructure improvements have a “improves” or “greatly improves” rating scale across the board. This is the result of having a wide range of infrastructure improvements within one objective category. The other strategies have more subdued ratings, indicating that they should be paired appropriately with the relevant infrastructure improvements. For instance, if improvements are made to Holcombe Boulevard, the goal of enhancing neighborhood character is not met, therefore, a project from the policy changes category such as promote compatible development should be chosen to address that need.

Table 8 shows a summary of the analysis. The relationships shown in this table can be used to guide the project selection and implementation process.

Table 8
Objectives/Improvements Relationship Matrix

Objectives	Project Categories			
	1. Policy Changes	2. Travel Demand Reduction	3. Transportation Operations	4. Infrastructure Improvements
Improve access to trauma centers, major activity areas, and redevelopment areas.	Improves	Neutral	Greatly improves	Greatly improves
Improve activity area and redevelopment area circulation by all modes of transportation.	Neutral	Improves	Greatly improves	Greatly improves
Increase activity center parking in accordance with demand, and locate major parking facilities on approach routes	Greatly improves	Improves	Improves	Greatly improves
Balance the transportation system to reduce dependence on personal motor vehicle travel.	Greatly improves	Greatly improves	Neutral	Improves
Enhance neighborhood character and conditions and local area cultural, educational, and recreational amenities through improved transportation services.	Greatly improves	Neutral	Improves	Improves
Provide emergency access during flood conditions and develop transportation improvements associated with flood remediation projects.	Neutral	Neutral	Improves	Greatly improves
Use available transportation resources effectively and efficiently.	Greatly improves	Improves	Greatly improves	Improves

* Scale: Greatly improves; Improves; and Neutral

7. EVALUATION OF SPECIFIC ALTERNATIVES

7.1 Added North/South Capacity – Brays Bayou Crossing

The goal of the additional Brays Bayou crossing is to add north/south capacity and to provide an alternate access point to the Texas Medical Center Trauma Centers. Numerous options have been reviewed; however, they can be grouped into the following three categories.

1. East Option – use Alameda Road via connection to MacGregor
2. Cambridge Corridor – extend Cambridge across Brays Bayou
3. West corridor – connect Cambridge south of Old Spanish Trail and N. MacGregor Way using a route west of the Devonshire subdivision

Following is a summary of issues associated with each of the three main options:

East Option

- The East option includes the extension of Dixie across Brays Bayou connecting Alameda Road to MacGregor Drive (which provides a connection to and North MacGregor Way).
- This option provides a new crossing of Brays Bayou.
- This option requires crossing park land adjacent to Alameda and at the connection to MacGregor north of Brays Bayou.
- To achieve long term significant mobility benefit, Alameda should be improved and possibly grade separated at major intersections.
- Need to improve access to IH-610 east to/from Alameda.
- The estimated construction cost for this option is about \$5.8 million.

Cambridge Corridor

- Two options were reviewed for the Cambridge Corridor:
 1. Construct a new four-lane road along the existing right-of-way and alignment.
 2. Move roadway eastward north of Old Spanish Trail and move back to existing right-of-way at Woodbury to avoid existing Veterans Administration building.Construct southbound one-way local street that does not connect to Cambridge to access residences that have exiting driveways on Cambridge between Woodbury and Wyndale. Alternatively, provide circulation between adjacent Devonshire streets with one-block connectors instead of one-way local street.
- Has impact on access to six single family parcels adjacent to Cambridge.
- Has some impact by crossing linear park area adjacent to Brays Bayou.

- Requires acquisition of right-of-way from Veterans Administration.
- Requires improvements to Cambridge south of OST, including intersections and improvements at IH-610 to achieve significant long range mobility improvements.
- Requires access across IH-610.
- The estimated construction cost for this option is about \$6.8 million.

West Corridor

The third alignment option along a corridor west of the residential development was reviewed; however, it is not recommended due to cost and the design required near Old Spanish Trail and across Brays Bayou.

- Requires condemnation of significantly more right-of-way than other options.
- Adversely impacts operation of Holcombe/Braeswood intersection, which currently operates at a low level of service during peak periods.
- In this option Braeswood may be moved to the east adjacent to Brays Bayou starting at Wyndale and ending east of North MacGregor Way. This requires extensive drainage analysis as well as approvals from the Harris County Flood Control District and possibly the Corps of Engineers.
- Requires improvements to Braeswood from Wyndale to North MacGregor Way.
- Has some impact on linear park area adjacent to Brays Bayou.
- Has significant impact on property north or south of OST depending on which alignment option is chosen. If the option north of Holcombe is chosen the reverse curve roadway geometrics are not desirable for a major collector street or thoroughfare.
- Has significant impact on South Extension Parking Facility whether it runs down Harvin Boulevard or along the east edge of the lot in some alignment options.
- Is the most expensive option for both right-of-way and construction costs.
- Has minimal impact on east side of residential area.
- Has some impact on west side of residential area.
- Requires improvements to Cambridge south of OST, including intersections and improvements at IH-610 to achieve significant long range mobility improvements.

- Requires access across IH-610.
- Most expensive option at a construction cost of about \$9.5 million.

7.2 Golf Course Drive

Hermann Park suffers from severe traffic congestion and parking shortages during approximately 40 peak days during the year. The study team was asked to examine options to alleviate these problems. The following five traffic options were identified:

- Maintain the current two-way operation and leave the road the way it is.
- Maintain the current two-way operation but realign the road to consolidate and expand the central parking lots.
- Maintain the current two-way operation but close off the central portion.
- One-way southbound operation and leave the road the way it is.
- One-way southbound operation but realign the road to consolidate and expand the central parking lots.

The feeling of the Friends of Hermann Park was that rerouting Golf Course Drive would be very expensive for the benefits to be gained. Additionally, the current meandering alignment is favorable for a park setting. The project team was requested to perform an analysis of permanent one-way versus two-way operation.

The following were identified as pros and cons of a permanent one-way system for Golf Course Drive:

Advantages of a Permanent One-Way System

- The existing temporary traffic controls do not have to be put in place to implement one-way traffic operation on heavy traffic days. This should reduce the costs of traffic control.
- The level-of-service at major area intersections will not be significantly impacted by permanent one-way operation primarily because the park peak is typically on weekends and does not coincide with the standard weekday peak at critical intersections.
- It removes eastbound left turns from MacGregor Way and eliminates queuing.
- No outbound traffic at Hermann Circle.
- Additional curb parking could be provided along Golf Course Drive.

- Parking lot access patterns would be better as conflicting left-turn movements along Golf Course Drive would be eliminated.

Disadvantages of a Permanent One-Way System

- Some travel would become more circuitous. The one-way travel pattern could increase the travel distance for ingress from the south and east and egress to the north.
- It will generate additional trips through the following intersections: Fannin/MacGregor and Fannin/Herrmann Circle.
- Vehicles can only enter the one-way system from Fannin northbound, from the Main Street circle eastbound across Fannin, and from Caroline.
- The park peak is on weekends and does not coincide with the standard weekday peak at major intersections. The level-of-service at these critical intersections will not be impacted as significantly, therefore, there is not a significant benefit for average days at the park.
- The number of entrances is reduced to two and the number of exits is reduced to one. Therefore, the access could more easily be impacted by a traffic accident or other incident.

Based on the analysis of the permanent conversion of Golf Course Drive to a one-way southbound roadway, it is recommended that this change not be implemented at this time.

However, it is recommended that peak day one-way southbound operation be maintained. The primary reason for leaving Golf Course Drive as a two-way roadway is that the significant traffic control benefits associated with the one-way system, that relate primarily to the 15 busiest days of the year, do not outweigh the negative impacts of longer travel patterns for some park and zoo visitors.

It is believed that improvements could be made to the operation of the park area facilities during peak times by scheduling special events on non-peak days. Additional improvements could be recognized by utilization of the new LRT system and related public information campaigns. Plans should be underway now, or should start soon, on utilization of the LRT for public access to the area. Finally, efforts to encourage use of the new entrance along North MacGregor Way and the possibility of moving forward with structured parking along the North MacGregor Way side of the park and zoo should be pursued further.

7.3 Park-and-Ride

When light rail service begins in January 2004, METRO plans to eliminate direct park-and-ride service to the Texas Medical Center. The routes that will be eliminated are included in Table 9.

Table 9
Routes to be Eliminated Due to New Light Rail

Route	Description
170 Missouri City	Operates via the TMC between Missouri City Park-and-Ride and downtown
291 Kuykendahl / North Shepherd	Operates between Kuykendahl and North Shepherd Park-and-Ride lots and the TMC; provides service in downtown Houston
292 West Bellfort / Westwood	Operates non-stop between West Bellfort and Westwood Park-and-Ride lots and the TMC
297 South Point / Monroe	Operates non-stop between South Point and Monroe Park-and-Ride lots and the TMC
298 Addicks / NWTC / TMC	Operates non-stop between the Addicks Park-and-Ride and Northwest Transit Center and the TMC

One concept investigated in this study is the idea of maintaining direct park-and-ride service to the TMC core and the Nabisco Building with routes that are not as conveniently intercepted by the new rail line. In the next few years, approximately 3,000 TMC administrative employees from a number of institutions will be relocated to the old Nabisco Building on Holcombe. These employees, by force of their numbers and their regular work schedules, will create a good market for park-and-ride transit.

Specifically, the study examined the potential for retaining a modified Route 297 South Point/Monroe/TMC and a modified Route 292 West Bellfort/Westwood/TMC. Both routes would operate east-west through the TMC area along Holcombe, complementing the north-south transit service provided by the LRT line. The rest of the park-and-ride routes currently operating directly to TMC are naturally intercepted by the rail line and would become rail feeder routes.

Route 297 South Point/Monroe currently carries nearly 500 passengers per day, a growth rate of about 37% over the past year. In METRO's annual route productivity ranking mode, this route ranks 238th out of 280 (in the upper part of the fourth quartile). The 292 West Bellfort/Westwood TMC carries about 450 passengers per day and also experienced significant ridership growth (37%) in the past year. This route ranks 254th out of 280 routes in the route productivity model (in the lower part of the fourth quartile). In various forms, METRO has provided this service since 1992.

Both routes have experienced significant growth lately, but considerably higher ridership is needed for these routes to rank in the third quartile of METRO's routes. While METRO seeks ways to improve third quartile routes, they are generally not candidates for elimination as are fourth quartile routes. The 297 South Point/Monroe route needs to gain approximately 225 more

daily boardings to reach the third quartile; the 292 West Bellfort/Monroe needs to gain approximately 425 more boardings.

The following actions are recommended:

- Review Route 292 one more time before eliminating it in January 2004. If the route has reached the third quartile, retain the route with a new alignment. Given the size of the increase needed and the length of time this service has been in place, this growth is unlikely to occur.
- Review Route 297 in about one year. Retain the route after implementation of light rail with the new alignment if ridership growth remains above the system average and the route continues to move up in the rankings. Retain the route if it reaches the third quartile one year after the implementation of light rail.
- Alternately, retain both routes if the Texas Medical Center or its institutions are willing to buy enough passes to guarantee third quartile performance by the routes.

8. REFERENCES

1. 2022 Metropolitan Transportation Plan. Houston-Galveston Transportation Management Area, Houston, February, 2000.
2. Transportation Research Circular 212, *Interim Materials on Highway Capacity*, Transportation Research Board, National Research Council, Washington, DC, January, 1980.
3. *Highway Capacity Manual*. Special Report 290, Transportation Research Board, National Research Council, Washington, D.C., 1997.

APPENDIX A: TMC COMMITTEE MEMBERSHIP

Steering Committee Members		Technical Committee Members	
Name	Organization	Name	Organization
Dean Currie	Rice University	Inas Aweida	HNTB Corp
Liz Christ	Texas Medical Center	Delvin Dennis	TXDOT
Roksas Okan-Vick	Friends of Hermann Park	Rick Dewees	Parks and Recreation Department
Jon Vanden Bosch	City of Houston	Kent Hadnot	OST/Alameda Corridors
Art Storey	Harris County	Evalyn Krudy	Southampton and Old Braeswood
Mike Surface	Reliant Park	Willie Loston	Harris County Sports & Conv.
Kathy Easterly	University Place Association	Andy Mao	Harris County
Gary Trietsch	TxDOT	Eugen Radulescu	Rice University
Susan Young	South Main Street Coalition	David Rieniets	The Spires
Peter Marzio.	Houston Museum District Assoc.	Akbar Tavangarian	TMC
Rick Dewees	Parks and Recreation Dept./Zoo	Douglas Wiersig	City of Houston
Harrell Rodgers	Devonshire Place Neighborhood Assn.	Susan Young	South Main Center Assn.
John Sedlak	METRO	Tammi Kahn	Houston Museum District Association
Theola Petteway	OST/Alameda Redevelopment Authority, TIRZ.#7	Miki Milovanovic	METRO
El Franco Lee	Harris County	Roksas Okan-Vick	Friends of Hermann Park
Mark Goldberg	City of Houston	Martha Rivera	City Council District D
Martha Rivera	City of Houston	Kelli Glanz	City Council District C
-	-	Jackie Freeman	Harris County Precinct #1
-	-	Bridget Jensen	City Council

APPENDIX B: VEHICLE AND PERSON DELAYS OF THE VARIOUS STRATEGIES

Vehicle Delays

	Intersection LOS				Total Vehicle Delay (hr)				Difference (hr)			
Intersection	Base	Strategy 1	Strategy 2	Strategy 3	Base	Strategy 1	Strategy 2	Strategy 3	Base	Strategy 1	Strategy 2	Strategy 3
Bissonnet/Kirby	F	F	F	F	325	305	305	305	0	20	20	20
Bissonnet/Greenbriar	F	F	F	F	128	116	116	110	0	12	12	18
Bissonnet-Binz/Main	C	C	C	C	80	69	69	50	0	11	11	30
Southmore/Alameda	D	D	D	C	45	45	45	50	0	0	0	-5
Sunset/Main	F	F	F	F	154	157	122	131	0	-3	32	23
Rice/Kirby	F	F	F	F	246	229	229	210	0	17	17	36
Rice/Greenbriar	F	F	F	F	102	89	156	156	0	13	-54	-54
MacGregor Way/Main	D	D	D	C	148	137	153	100	0	10	-6	47
MacGregor Way/Fannin	D	D	D	D	129	113	113	65	0	16	16	64
University/Kirby	F	F	F	F	256	240	240	220	0	17	17	36
University/Greenbriar	D	F	F	F	44	95	112	74	0	-51	-68	-29
University/Main	F	F	F	F	182	186	159	157	0	-4	23	25
University/Fannin	E	E	E	D	64	61	61	61	0	3	3	3
MacGregor Way/Golf Course Dr.	B	B	B	B	120	99	99	71	0	21	21	49
Braeswood/N. MacGregor Way	E	E	F	F	170	148	208	208	0	22	-38	-38
Holcombe/Kirby	F	E	F	D	282	184	208	122	0	98	74	160
Holcombe/Greenbriar	F	C	B	B	172	54	86	39	0	118	86	134
Holcombe/Main	F	D	E	E	334	171	252	146	0	163	81	187
Holcombe/Fannin	D	C	D	C	207	59	186	48	0	148	22	159
Holcombe/Bertner	D	C	D	C	128	47	131	50	0	81	-3	79
Holcombe/Freeman	B	A	B	A	86	32	104	35	0	54	-18	51
Holcombe/Braeswood	E	C	-	E	186	58	0	148	0	128	186	38
Holcombe/Cambridge	A	B	F	E	82	59	131	196	0	23	-49	-114
Holcombe/Alameda	E	D	E	E	167	110	147	140	0	57	20	27
Main/Greenbriar	F	F	F	E	264	142	142	144	0	122	122	120
Braeswood/Fannin	D	D	C	C	108	93	82	94	0	15	26	14
Main/Kirby	F	E	E	F	329	177	177	214	0	151	151	115
OST/Main	E	B	C	B	196	96	122	87	0	101	74	110

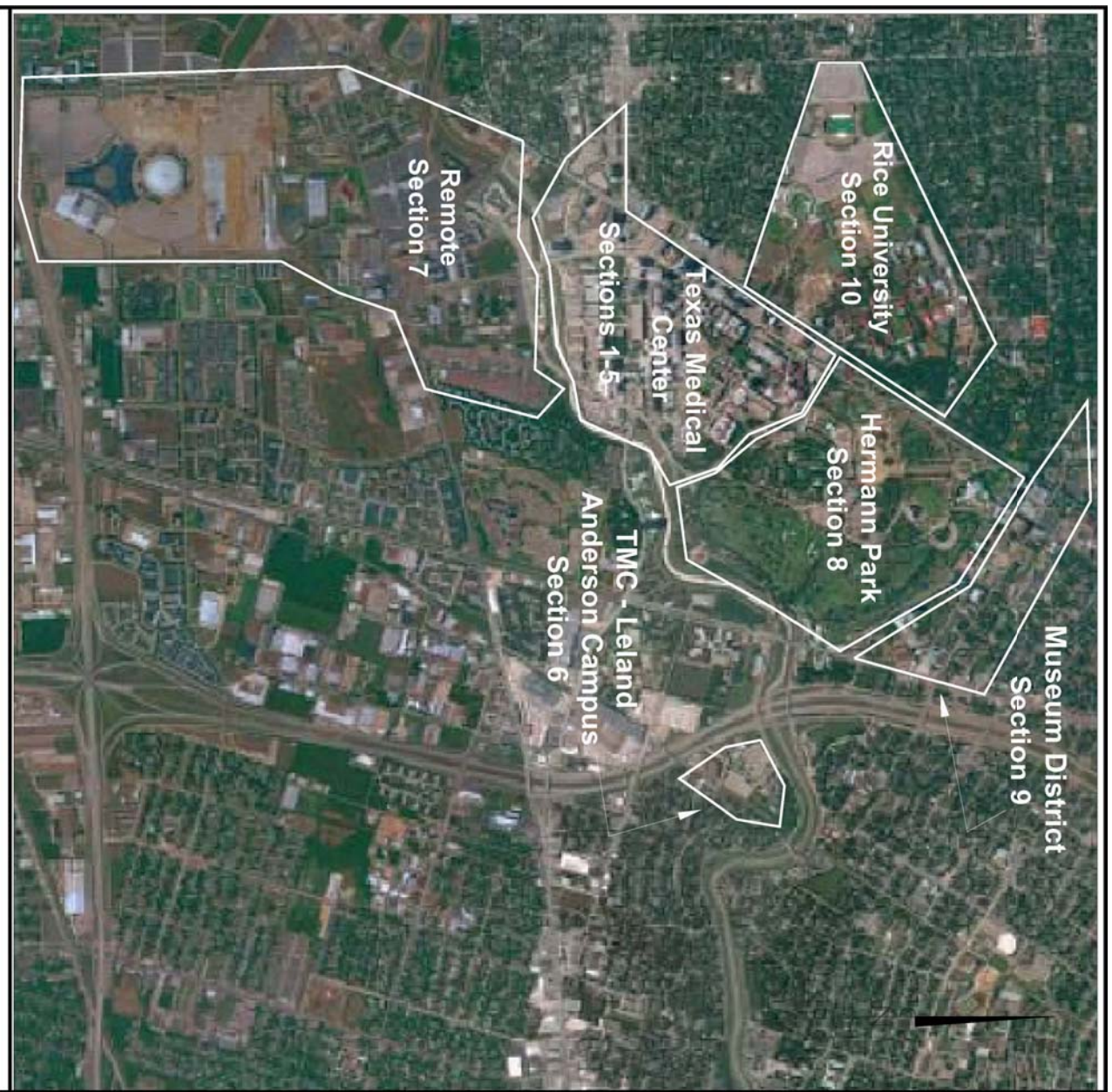
OST/Kirby	F	C	D	D	241	72	101	94	0	168	140	147
OST/Greenbriar	F	E	F	D	332	126	142	128	0	207	191	205
OST/Fannin	F	B	C	B	249	36	77	42	0	213	172	207
OST/Cambridge	B	C	A	C	62	81	34	64	0	-20	28	-3
OST/Almeda	E	C	D	C	128	37	69	56	0	92	60	72
Fannin/Greenbriar	F	A	D	C	241	43	86	70	0	199	155	171
Knight/Fannin	F	D	C	D	113	74	49	72	0	40	64	42
Murworth/Main	D	B	B	B	285	188	188	161	0	97	97	124
Holly Hall/Fannin	D	A	A	A	242	44	44	69	0	198	198	173
Holly Hall/Knight	C	D	E	D	65	87	140	116	0	-21	-75	-50
Holly Hall/Almeda	F	D	D	D	194	65	86	83	0	129	109	111
Buffalo Speedway/Main	E	C	D	C	332	242	242	242	0	90	90	90
Braeswood/Kirby	D	D	D	D	121	115	158	100	0	6	-37	20
Braeswood/Main	E	E	F	E	256	220	308	179	0	36	-52	77
Braeswood/Greenbriar	F	E	E	D	187	120	157	181	0	67	30	6
Braeswood/Bertner	D	D	E	E	103	73	164	120	0	30	-61	-16
Braeswood/Pressler	B	B	D	F	22	14	80	145	0	8	-58	-122
OST/Bertner	F	D	E	C	249	86	167	81	0	163	81	168
Cambridge/Hollyhall	C	D	A	B	62	128	7	42	0	-66	55	20
Holcombe/Galen (west)	C	B	B	A	208	127	130	15	0	81	77	192
Holcombe/Galen (east)	-	-	-	A	0	0	0	9	0	0	0	-9
Main/Galen	E	E	E	C	228	166	166	106	0	63	63	123
Galen/Fannin	C	C	C	C	92	92	69	77	0	0	22	14
Galen/Bertner	E	E	F	D	136	136	180	77	0	0	-44	60
MacGregor/Almeda	F	F	F	F	236	226	201	258	0	10	34	-22
Total					9,120	5,966	7,002	6,018	0	3,154	2,118	3,102

Person Delays

	Intersection LOS				Total Person Delay (hr)				Difference			
Intersection	Base	Strategy 1	Strategy 2	Strategy 3	Base	1	Strategy 2	Strategy 3	Base	Strategy 1	Strategy 2	Strategy 3
Bissonnet/Kirby	F	F	F	F	402	378	378	378	0	23	23	23
Bissonnet/Greenbriar	F	F	F	F	170	155	155	147	0	15	15	23
Bissonnet-Binz/Main	C	C	C	C	110	94	94	69	0	15	15	41
Southmore/Alameda	D	D	D	C	57	57	57	63	0	0	0	-7
Sunset/Main	F	F	F	F	203	206	161	171	0	-3	43	32
Rice/Kirby	F	F	F	F	309	289	289	265	0	20	20	44
Rice/Greenbriar	F	F	F	F	126	110	195	195	0	16	-69	-69
MacGregor Way/Main	D	D	D	C	199	183	199	133	0	16	-1	66
MacGregor Way/Fannin	D	D	D	D	181	162	162	95	0	19	19	85
University/Kirby	F	F	F	F	336	316	316	291	0	20	20	44
University/Greenbriar	D	F	F	F	63	142	162	100	0	-79	-100	-37
University/Main	F	F	F	F	263	267	233	229	0	-4	30	34
University/Fannin	E	E	E	D	81	77	77	76	0	4	4	5
MacGregor Way/Golf Course Dr.	B	B	B	B	166	141	141	100	0	25	25	65
Braeswood/N. MacGregor Way	E	E	F	F	217	190	259	259	0	26	-42	-42
Holcombe/Kirby	F	E	F	D	355	230	262	158	0	125	93	197
Holcombe/Greenbriar	F	C	B	B	221	70	118	54	0	151	103	168
Holcombe/Main	F	D	E	E	460	244	343	208	0	216	117	252
Holcombe/Fannin	D	C	D	C	272	87	240	70	0	185	33	202
Holcombe/Bertner	D	C	D	C	178	67	186	73	0	111	-8	106
Holcombe/Freeman	B	A	B	A	118	45	147	51	0	73	-29	67
Holcombe/Braeswood	E	C	-	E	254	83	0	185	0	171	254	69
Holcombe/Cambridge	A	B	F	E	116	81	175	276	0	35	-58	-160
Holcombe/Alameda	E	D	E	E	221	149	192	182	0	72	29	39
Main/Greenbriar	F	F	F	E	341	185	185	185	0	156	156	156
Braeswood/Fannin	D	D	C	C	144	119	109	123	0	25	35	21
Main/Kirby	F	E	E	F	401	217	217	259	0	184	184	142
OST/Main	E	B	C	B	236	115	147	104	0	121	89	132
OST/Kirby	F	C	D	D	310	96	131	123	0	214	178	187
OST/Greenbriar	F	E	F	D	465	192	209	194	0	273	256	271

OST/Fannin	F	B	C	B	319	48	103	57	0	271	216	262
OST/Cambridge	B	C	A	C	79	100	44	81	0	-21	35	-2
OST/Almeda	E	C	D	C	159	46	86	70	0	113	73	89
Fannin/Greenbriar	F	A	D	C	309	58	113	92	0	250	196	217
Knight/Fannin	F	D	C	D	148	100	68	98	0	47	80	50
Murworth/Main	D	B	B	B	349	232	232	199	0	117	117	150
Holly Hall/Fannin	D	A	A	A	343	70	70	104	0	273	273	239
Holly Hall/Knight	C	D	E	D	88	117	191	158	0	-29	-102	-70
Holly Hall/Almeda	F	D	D	D	242	84	108	106	0	158	134	136
Buffalo Speedway/Main	E	C	D	C	418	308	308	308	0	110	110	110
Braeswood/Kirby	D	D	D	D	156	152	209	132	0	4	-52	25
Braeswood/Main	E	E	F	E	322	278	389	227	0	43	-67	94
Braeswood/Greenbriar	F	E	E	D	249	159	203	227	0	90	46	21
Braeswood/Bertner	D	D	E	E	124	88	197	144	0	36	-73	-20
Braeswood/Pressler	B	B	D	F	29	19	98	195	0	10	-70	-166
OST/Bertner	F	D	E	C	309	108	208	101	0	201	101	207
Cambridge/Hollyhall	C	D	A	B	79	161	9	54	0	-82	70	26
Holcombe/Galen (west)	C	B	B	A	308	195	199	24	0	113	109	284
Holcombe/Galen (east)	-	-	-	A	0	0	0	13	0	0	0	-13
Main/Galen	E	E	E	C	355	258	258	167	0	97	97	187
Galen/Fannin	C	C	C	C	136	136	109	119	0	0	27	17
Galen/Bertner	E	E	F	D	192	192	254	109	0	0	-63	82
MacGregor/Almeda	F	F	F	F	292	280	249	318	0	12	42	-27
Total					11,977	7,939	9,242	7,920	0	4,039	2,735	4,057

APPENDIX C: PARKING EVALUATION



Appendix C-Figure 1



Appendix C-Figure 2

The following were assumed to be the major approach routes to/from the TMC area:

- MacGregor Drive ➤ Alameda Road
- Hermann Drive ➤ Fannin Street
- Braeswood Boulevard ➤ Main Street
- Holcombe Boulevard ➤ Bissonnet Street

Texas Medical Center – Parking within Section 1

Institutions within Section 1	Existing Parking Spaces		Approach Route(s)
Children's Nutrition Research Center	Garage 1	1,090	*Fannin St
Diagnostic Center Hospital	Garage 2	2,016	*Holcombe Blvd.
St. Lukes's Episcopal Hospital	Garage 7	901	John Freeman Ave.
Texas Children Hospital	Garage 9	170	*Holcombe Blvd.
Texas Heart Institute	Garage 11	397	*Holcombe Blvd.
Texas Women's University	Garage 12	262	*Fannin St
Institute of Religion	Lot F	74	Bertner Ave.
Methodist Hospital	Lot N	101	*Holcombe Blvd.
	Lot O	99	*Holcombe Blvd.
	Lot Q	N/A	Bertner Ave.
	Lot S	N/A	*Holcombe Blvd./Fannin St.
	Lot T	78	Bertner Ave.
	Lot X	28	*Fannin St
	St. Lukes Medical Tower Garage	N/A	*Fannin St
	Scurlock Tower Garage	1,658	*Fannin St
	Smith Tower Garage	1,432	*Fannin St
	Total Existing Parking Spaces = 8,306		% Parking Along Approach Routes = 87%
	Proposed Garage		Approach Route(s)
	Proposed Garage – A	1,550	*Main St.
	Proposed Garage - F	1,550	*Main St.
	Total W/Proposed Parking Garages = 11,406		% Parking Along Approach Routes = 91%
	*Indicates Major Approach Routes		

Texas Medical Center – Parking within Section 2

Institutions within Section 2	Existing Parking Spaces		Approach Route(s)
Memorial Hermann Hospital	Garage 3	119	*MacGregor Drive
UT - Houston Medical School	Garage 4	1,659	John Freeman Ave.
HAM/TMC Library	Lot A	85	*Fannin St.
	Lot B	35	Ross Sterling Ave.
	Total Existing Parking Spaces = 1,898		% Parking Along Approach Routes = 11%
	Proposed Garage		Approach Route(s)
	Proposed Garage – B	1,550	*MacGregor Drive
	Proposed Garage – H	1,550	*Fannin St.
	Total W/Proposed Parking Garages = 4,998		% Parking Along Approach Routes = 66%
*Indicates Major Approach Routes			

Texas Medical Center – Parking within Section 3

Institutions within Section 3	Existing Parking Spaces		Approach Route(s)
Baylor College of Medicine	Ben Taub Garage	520	*MacGregor Drive
Ben Taub General Hospital	Garage 6	1,052	Moursund St.
Houston Department of Health & Human Services	DD Lot	83	Moursund St.
University of Houston College of Pharmacy	Lot D	60	E. Cullen St.
TIRR - Institute for Rehabilitation and Research	Lot E	65	E. Cullen St.
	Lot EE	16	Lamar Fleming St.
	Lot GG	87	Moursund St./Lamar Fleming St.
	Total Existing Parking Spaces = 1,883		% Parking Along Approach Routes = 28%
	Proposed Garage		Approach Route(s)
	Proposed Garage – I	1,550	Moursund St.
	Total W/Proposed Parking Garages = 3,433		% Parking Along Approach Routes = 15%
*Indicates Major Approach Routes			

Texas Medical Center – Parking within Section 4

Institutions within Section 4	Existing Parking Spaces		Approach Route(s)
Ronald McDonald House	Garage 5	491	*Braeswood Blvd/John Freeman Ave.
Rotary House International	Garage 10	1,529	*Braeswood Blvd/John Freeman Ave.
The Hospice at the Texas Medical Center	Garage 17	1,779	*Braeswood Blvd.
UT– M.D. Anderson Cancer Center	Lot AA	N/A	*Braeswood Blvd/John Freeman Ave.
UT Houston Health Science Center Dental Branch	Lot BB	N/A	*Braeswood Blvd/John Freeman Ave.
Graduate School of Biomedical Sciences	Lot GS	N/A	Herman Pressler St.
Houston School of Public Health	Lot J	49	Moursund St.
Mental Science Institute	Lot K/I	417	Bertner Ave./Moursund St.
	Lot P – 2	N/A	Herman Presslar St.
	Lot P – 3	52	Herman Presslar St.
	Lot P – 4 & 5	150	Herman Presslar St.
	Lot RR	42	*Braeswood Blvd/Moursund St.
	Total Existing Parking Spaces = 4,509		% Parking Along Approach Routes = 85%
*Indicates Major Approach Routes			

Texas Medical Center – Parking within Section 5

Institutions within Section 5	Existing Parking Spaces		Approach Route(s)
Albert B. Alkek Institute of Biosciences	Garage 8	119	*Holcombe Blvd.
Houston Community College	AU Lot	554	*Fannin St./Galen Dr.
Shriners Hospital for Children	South Main Lot	577	*Fannin St.
TMC/Edwin Hornberger Conference Center	Lot AM	32	*Holcombe Blvd./Main St./Shamrock Dr.
UT - Houston Heath Science Center	Lot M	255	*Holcombe Blvd./Main St./Shamrock Dr.
	Total Existing Parking Spaces = 1,843		% Parking Along Approach Routes = 100%
	Proposed Garage		Approach Route(s)
	Proposed Garage – Alt. 1 or 2	1,550	*Fannin St.
	Proposed Garage – G	1,550	*Holcombe Blvd
	Total W/Proposed Parking Garages = 4,943		% Parking Along Approach Routes = 100%
*Indicates Major Approach Routes			

Texas Medical Center – Leland Anderson Campus

Institutions within Leland Anderson Campus	Existing Parking Spaces		Approach Route(s)
Child Care Center, YMCA	AC Lot	483	*MacGregor Way/SH 288
Eastwood Building	CCC Lot	79	*MacGregor Way/SH 288
Michael E. DeBakey HS for Health Professions	LAV Lot - C/V	481	*MacGregor Way/SH 289
	Total Existing Parking Spaces = 1,043		% Parking Along Approach Routes = 100%
	Proposed Garage		Approach Route(s)
	Proposed Garage – C	1,550	*Main St.
	Total W/Proposed Parking Garages = 2,593		% Parking Along Approach Routes = 100%
*Indicates Major Approach Routes			

Texas Medical Center – Remote

Existing Parking Spaces		Approach Route(s)
Garage 14	418	*Braeswood Blvd
South Extension Lot	4,213	*Braeswood Blvd
Reliant Park (estimated spaces)	21,000	*Fannin St./Kirby Dr.
Meyer Lots North & South	979	*Braeswood Blvd/Greenbriar Dr
Smithlands Parking Lots	3,517	*Braeswood Blvd/Old Spanish/Greenbriar Dr.
Total Existing Parking Spaces = 30,127		% Parking Along Approach Routes = 100%
Proposed Garage		Approach Route(s)
Proposed Garage – D	1,550	*Main St.
Total W/Proposed Parking Garages = 31,677		% Parking Along Approach Routes = 100%
<i>*Indicates Major Approach Routes</i>		

Texas Medical Center – Hermann Park

Institutions within Hermann Park	Existing Parking Spaces		Approach Route(s)
The Houston Zoo	Sam Houston Circle	58	*Hermann Dr./Fannin St.
Judson Robinson Center	Golf Course Drive at Hermann Museum of Natural Science	49	*Hermann Dr./Golf Course Dr.
Miller Outdoor theater	Hermann Museum of Natural Science Garage	414	*Hermann Dr./Caroline St.
Herman Park Golf Course	Caroline at Hermann Museum of Natural Science	81	*Hermann Dr./Caroline St.
Houston Garden Center	Garden Center	290	*Hermann Dr./Golf Course Dr.
Hermann Museum of Natural Science	Judson Robinson Center	103	*Almeda Rd./Hermann Dr.
	Miller Employee Parking	63	Golf Course Dr.
	Miller Accessible Parking	13	Golf Course Dr.
	Central Parking Lot	298	Golf Course Dr.
	Zoo Parking Lot	490	*MacGregor St.
	Central Lot at Miller	79	Golf Course Dr.
	Palmer Church Lot	68	*Main St
	Old Clubhouse	342	Gold Course Dr.
	Golf Course Drive at Zoo	100	Golf Course Dr.
	Total Existing Parking Spaces = 2,448		% Parking Along Approach Routes = 63%
*Indicates Major Approach Routes			

Texas Medical Center – Museum District

Institutions within Museum District	Existing Parking Spaces		Approach Route(s)
The Museum of Fine Arts Houston	Classical School of Arts	34	*Main St.
Holocaust Museum Houston	Museum of Fine Arts	223	*Main St./Bissonnet St.
The Children's Museum of Houston	Church - First Presbyterian	248	*Main St.
Contemporary Arts Museum	Church - St. Paul's Methodist	218	*Main St.
Museum of Health & Medical Science	Museum of Contemporary Arts	8	*Bissonnet St./Montrose Blvd.
Houston Museum of Natural Science	Total Existing Parking Spaces = 731		% Parking Along Approach Routes = 100%
	Proposed Garage		Approach Route(s)
	Proposed Garage – E	1,550	*Hermann Dr./Caroline St.
	Total W/Proposed Parking Garages = 2,281		% Parking Along Approach Routes = 100%
*Indicates Major Approach Routes			

Texas Medical Center – Rice University

Existing Parking Spaces		Approach Route(s)
East Campus	1,545	*Main St./Rice
West Campus	5,491	Greenbriar St. /Rice Blvd./University Blvd.
Total Existing Parking Spaces = 7,036		% Parking Along Approach Routes = 22%
<i>*Indicates Major Approach Routes</i>		

APPENDIX D: BIKEWAY EVALUATION

Evaluation for Strategy 1

Bikeway	2025 Weighted Average Daily Traffic Volume		Connectability		Type of Area Development	Points	Ease Implementation	Points	Rating
	Veh/Day	Points	Connects To:	Points					
Alabama	14,000	5	Bikeway/Sidewalk	5	Residential	10	Proposed - Shared Lane	8	28
Eastside	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Shared Lane	8	33
Greenbriar	<12,000*	10	Rice	10	Residential	10	Proposed - Shared Lane	8	38
Bissonnet	15,082	5	Bikeway/Sidewalk	5	Residential	10	Existing - Shared Lane	10	30
Lexington	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Shared Lane	8	33
Woodhead	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Shared Lane	10	35
Mandell	<12,000*	10	Rice	10	Residential	10	Existing - Shared Lane	10	40
Yoakum	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Bike Lane	10	35
Hawthorne	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Shared Lane	10	35
La Branch	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	30
Crawford	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	30
Wake Forest	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	30
Sunset	15,000	5	Rice	10	Residential	10	Proposed - Shared Lane	8	33
Hazard	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Shared Lane	10	35
Bolsover	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Shared Lane	10	35
Rice	14,092	5	Rice	10	Residential	10	Proposed - Bike Lane	5	30
Kent	<12,000*	10	Rice	10	Residential	10	Proposed - Shared Lane	8	38
Westpark	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Bike Lane	10	35
Golf Course Drive	<12,000*	10	Hermann Park	10	Residential	10	Proposed - Shared Lane	8	38
Southmore	10,715	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	30
Caroline	<12,000*	10	Hermann Park	10	Residential	10	Existing - Shared Lane	10	40
University	12,828	5	Rice	10	Residential	10	Proposed - Bike Lane	5	30
Morningside	<12,000*	10	Reliant	5	Residential	10	Existing - Shared Lane	10	35
Swift	<12,000*	10	TMC	10	Residential	10	Proposed - Shared Lane	8	38
Brompton	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Shared Lane	8	33
Durhill/Murworth	<12,000*	10	Reliant	5	Other	0	Proposed - Shared Lane	8	23
N. MacGregor Way	23,000	5	TMC	10	Other	0	Proposed - Bike Lane	5	20
Dixie	<12,000*	10	TMC	10	Other	0	Proposed - Bike Lane	5	25
Hermann	13,000	5	Hermann Park	10	Residential	10	Existing - Bike Lane	10	35
Almeda	17,213	5	TMC	10	Other	0	Proposed - Multiuse Trail	0	15
Holly Hall	13,218	5	Bikeway/Sidewalk	5	Residential	10	Existing - Multiuse Trail	10	30
Cambridge	25,000	0	TMC	10	Residential	10	Existing - Bike Lane	10	30
Yellowstone	15,000	5	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	25
Ardmore	<12,000*	10	Bikeway/Sidewalk	5	Other	0	Existing - Bike Lane	10	25
Tierwester	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	30
Bertner	<12,000*	10	TMC	10	Other	0	Proposed - Shared Lane	8	28
William C. Harvin	19,000	5	TMC	10	Other	0	Proposed - Shared Lane	8	23
Brays Bayou	0	10	TMC	10	Residential	10	Existing - Multiuse Trail	10	40
							Strategy 1 Total Score = 1196 (Total Possible Score = 1520)		

Evaluation for Strategy 2

Bikeway	2025 Weighted Average Daily Traffic Volume		Connectability		Type of Area Development	Points	Ease Implementation	Points	Rating
	Veh/Day	Points	Connects To:	Points					
Alabama	14,000	5	Bikeway/Sidewalk	5	Residential	10	Proposed - Shared Lane	8	28
Eastside	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Shared Lane	8	33
Greenbriar	<12,000*	10	Rice	10	Residential	10	Proposed - Shared Lane	8	38
Bissonnet	15,082	5	Bikeway/Sidewalk	5	Residential	10	Existing - Shared Lane	10	30
Lexington	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Shared Lane	8	33
Woodhead	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Shared Lane	10	35
Mandell	<12,000*	10	Rice	10	Residential	10	Existing - Shared Lane	10	40
Yoakum	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Bike Lane	10	35
Hawthorne	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Shared Lane	10	35
La Branch	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	30
Crawford	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	30
Wake Forest	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	30
Sunset	15,000	5	Rice	10	Residential	10	Proposed - Shared Lane	8	33
Hazard	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Shared Lane	10	35
Bolsover	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Shared Lane	10	35
Rice	10,815	10	Rice	10	Residential	10	Proposed - Bike Lane	5	35
Kent	<12,000*	10	Rice	10	Residential	10	Proposed - Shared Lane	8	38
Westpark	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Bike Lane	10	35
Golf Course Drive	<12,000*	10	Hermann Park	10	Residential	10	Proposed - Shared Lane	8	38
Southmore	10,715	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	30
Caroline	<12,000*	10	Hermann Park	10	Residential	10	Existing - Shared Lane	10	40
University	12,828	5	Rice	10	Residential	10	Proposed - Bike Lane	5	30
Morningside	<12,000*	10	Reliant	5	Residential	10	Existing - Shared Lane	10	35
Swift	<12,000*	10	TMC	10	Residential	10	Proposed - Shared Lane	8	38
Brompton	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Shared Lane	8	33
Durhill/Murworth	<12,000*	10	Reliant	5	Other	0	Proposed - Shared Lane	8	23
N. MacGregor Way	23,000	5	TMC	10	Other	0	Proposed - Bike Lane	5	20
Dixie	<12,000*	10	TMC	10	Other	0	Proposed - Bike Lane	5	25
Hermann	13,000	5	Hermann Park	10	Residential	10	Existing - Bike Lane	10	35
Almeda	21,454	5	TMC	10	Other	0	Proposed - Multiuse rail	0	15
Holly Hall	29,941	0	Bikeway/Sidewalk	5	Residential	10	Existing - Multiuse trail	10	25
Cambridge	21,000	5	TMC	10	Residential	10	Existing - Bike Lane	10	35
Yellowstone	15,000	5	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	25
Ardmore	<12,000*	10	Bikeway/Sidewalk	5	Other	0	Existing - Bike Lane	10	25
Tierwester	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	30
Bertner	<12,000*	10	TMC	10	Other	0	Proposed - Shared Lane	8	28
William C. Harvin	28,000	0	TMC	10	Other	0	Proposed - Shared Lane	8	18
Brays Bayou	0	10	TMC	10	Residential	10	Existing - Multiuse rail	10	40
							Strategy 2 Total Score =		1196
							(Total Possible Score = 1520)		

Evaluation for Strategy 3

Bikeway	2025 Weighted Average Daily Traffic Volume		Connectability		Type of Area Development	Points	Ease Implementation	Points	Rating
	Veh/Day	Points	Connects To:	Points					
Alabama	14,000	5	Bikeway/Sidewalk	5	Residential	10	Proposed - Shared Lane	8	28
Eastside	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Shared Lane	8	33
Greenbriar	<12,000*	10	Rice	10	Residential	10	Proposed - Shared Lane	8	38
Bissonnet	15,082	5	Bikeway/Sidewalk	5	Residential	10	Existing - Shared Lane	10	30
Lexington	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Shared Lane	8	33
Woodhead	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Shared Lane	10	35
Mandell	<12,000*	10	Rice	10	Residential	10	Existing - Shared Lane	10	40
Yoakum	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Bike Lane	10	35
Hawthorne	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Shared Lane	10	35
La Branch	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	30
Crawford	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	30
Wake Forest	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	30
Sunset	15,000	5	Rice	10	Residential	10	Proposed - Shared Lane	8	33
Hazard	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Shared Lane	10	35
Bolsover	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Shared Lane	10	35
Rice	10,815	10	Rice	10	Residential	10	Proposed - Bike Lane	5	35
Kent	<12,000*	10	Rice	10	Residential	10	Proposed - Shared Lane	8	38
Westpark	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Existing - Bike Lane	10	35
Golf Course Drive	<12,000*	10	Hermann Park	10	Residential	10	Proposed - Shared Lane	8	38
Southmore	10,715	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	30
Caroline	<12,000*	10	Hermann Park	10	Residential	10	Existing - Shared Lane	10	40
University	12,828	5	Rice	10	Residential	10	Proposed - Bike Lane	5	30
Morningside	<12,000*	10	Reliant	5	Residential	10	Existing - Shared Lane	10	35
Swift	<12,000*	10	TMC	10	Residential	10	Proposed - Shared Lane	8	38
Brompton	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Shared Lane	8	33
Durhill/Murworth	<12,000*	10	Reliant	5	Other	0	Proposed - Shared Lane	8	23
N. MacGregor Way	23,000	5	TMC	10	Other	0	Proposed - Bike Lane	5	20
Dixie	<12,000*	10	TMC	10	Other	0	Proposed - Bike Lane	5	25
Hermann	13,000	5	Hermann Park	10	Residential	10	Existing - Bike Lane	10	35
Almeda	21,667	5	TMC	10	Other	0	Proposed - Multiuse Trail	0	15
Holly Hall	11,155	10	Bikeway/Sidewalk	5	Residential	10	Existing - Multiuse Trail	10	35
Cambridge	10,000	10	TMC	10	Residential	10	Existing - Bike Lane	10	40
Yellowstone	15,000	5	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	25
Ardmore	<12,000*	10	Bikeway/Sidewalk	5	Other	0	Existing - Bike Lane	10	25
Tierwester	<12,000*	10	Bikeway/Sidewalk	5	Residential	10	Proposed - Bike Lane	5	30
Bertner	<12,000*	10	TMC	10	Other	0	Proposed - Shared Lane	8	28
William C. Harvin	21,000	5	TMC	10	Other	0	Proposed - Shared Lane	8	23
Brays Bayou	0	10	TMC	10	Residential	10	Existing - Multiuse Trail	10	40
							Strategy 3 Total Score =		1216
							(Total Possible Score = 1520)		

APPENDIX E: RESIDENTIAL AND PARK FRONTAGE

Daily Vehicle-Miles Traveled of Residential and Park Frontage

Greater Texas Medical Center Area Transportation Master Plan

Source: Walter P. Moore

Roadway Information				Residential	Park	Roadway Length (ft) *		Average Annual Daily Traffic **				Thousand Vehicle-Miles Traveled							
Direction	Name	Segment		(Measured in Drawing)		On Residential Land Use	On Park Land Use	Base Case	Strategy 1	Strategy 2	Strategy 3	Residential Land Use				Park Land Use			
		From	To									Base Case	Strategy 1	Strategy 2	Strategy 3	Base	Strategy 1	Strategy 2	Strategy 3
A. Existing Thoroughfares and Major Collectors																			
N - S	Kirby	Bissonnet	Rice	0.3		500		64,000	60,000	60,000	60,000	6.06	5.68	5.68	5.68				
		Rice	University	0.5		800		30,000	35,000	35,000	35,000	4.55	5.30	5.30	5.30				
		University	Holcombe	1.85		3,100		59,000	55,000	55,000	55,000	34.64	32.29	32.29	32.29				
		Holcombe	Braeswood	1.6	0.2	2,700	300	30,000	26,000	26,000	26,000	15.34	13.30	13.30	13.30	1.70	1.48	1.48	1.48
		Braeswood	Main	0.2		300		30,000	22,000	22,000	30,000	1.70	1.25	1.25	1.70				
	Greenbriar	SW Freeway	Bissonnet	0.9		1,500		30,000	25,000	25,000	25,000	8.52	7.10	7.10	7.10				
		Bissonnet	Rice	1.75		3,000		19,000	14,000	22,000	22,000	10.80	7.95	12.50	12.50				
		University	Holcombe	1.95		3,300		15,000	10,000	10,000	10,000	9.38	6.25	6.25	6.25				
		Holcombe	Main	1.25		2,100		15,000	10,000	10,000	10,000	5.97	3.98	3.98	3.98				
		Main	Braeswood	0.4	0.2	700	300	13,000	13,000	13,000	13,000	1.72	1.72	1.72	1.72	0.74	0.74	0.74	0.74
	Shepard	SW Freeway	Bissonnet	0.95		1,600		24,000	24,000	24,000	24,000	7.27	7.27	7.27	7.27				
		Bissonnet	Rice	1.6		2,700		12,000	12,000	12,000	12,000	6.14	6.14	6.14	6.14				
	Dunlavy	SW Freeway	Bissonnet	1.1		1,900													
	Montrose	SW Freeway	Bissonnet	0.35	0.45	600	800	30,000	30,000	30,000	30,000	3.41	3.41	3.41	3.41	4.55	4.55	4.55	4.55
	Main	Braeswood	Greenbriar	0.75	0.25	1,300	400	41,000	36,000	36,000	36,000	10.09	8.86	8.86	8.86	3.11	2.73	2.73	2.73
		Greenbriar	Holcombe	0.45		800		39,000	36,000	36,000	36,000	5.91	5.45	5.45	5.45				
		Holcombe	University	0.3		500		35,000	37,000	32,000	37,000	3.31	3.50	3.03	3.50				
		Macgregor	Sunset		1.05		1,800	37,000	34,000	34,000	39,000					12.61	11.59	11.59	13.30
		Sunset	Montrose	0.9	0.9	1,500	1,500	31,000	28,000	28,000	28,000	8.81	7.95	7.95	7.95	8.81	7.95	7.95	7.95
	Fannin	Hollyhall	Greenbriar	0.75		1,300		48,000	27,000	27,000	30,000	11.82	6.65	6.65	7.39				
		Old Spanish	Braeswood	0.5		800		25,000	18,000	22,000	24,000	3.79	2.73	3.33	3.64				
		Macgregor	Sunset		1.25		2,100	34,000	32,000	32,000	32,000					13.52	12.73	12.73	12.73
		Sunset	Hermann		0.85		1,400	34,000	32,000	32,000	32,000					9.02	8.48	8.48	8.48
		Hermann	Binz	0.1		200		18,000	16,000	16,000	16,000	0.68	0.61	0.61	0.61				

		Southmore	Blodget	0.15		300		21,000	19,000	19,000	19,000	1.19	1.08	1.08	1.08				
	Cambridge	South Loop	Hollyhall	0.6		1,000		10,000	21,000	7,000	8,000	1.89	3.98	1.33	1.52				
		Hollyhall	Old Spanish	2.75		4,600		10,000	25,000	7,000	10,000	8.71	21.78	6.10	8.71				
	Almeda	Hollyhall	El Camino	0.5		800		32,000	17,000	22,000	23,000	4.85	2.58	3.33	3.48				
		El Camino	La Concha	0.3		500		32,000	17,000	27,000	23,000	3.03	1.61	2.56	2.18				
		La Concha	Old Spanish	1.55		2,600		29,000	17,000	23,000	23,000	14.28	8.37	11.33	11.33				
		Old Spanish	Holcombe	0.1		200		18,000	9,000	15,000	15,000	0.68	0.34	0.57	0.57				
		Holcombe	Macgregor		1.5		2,500	22,000	22,000	32,000	28,000					10.42	10.42	15.15	13.26
		Macgregor	Hermann	0.2	0.6	300	1,000	17,000	17,000	17,000	17,000	0.97	0.97	0.97	0.97	3.22	3.22	3.22	3.22
		Hermann	Binz	0.05		100		12,000	12,000	12,000	12,000	0.23	0.23	0.23	0.23				
		Binz	Southmore	0.1		200		12,000	12,000	12,000	12,000	0.45	0.45	0.45	0.45				
		Southmore	Blodget	0.1		200		12,000	12,000	12,000	12,000	0.45	0.45	0.45	0.45				
		Blodget	Wheeler		0.1		200	12,000	12,000	12,000	12,000					0.45	0.45	0.45	0.45
		Wheeler	SW Freeway		0.5		800	12,000	12,000	12,000	12,000					1.82	1.82	1.82	1.82
E -W	Bissonnet	Kirby	Greenbriar	0.3		500		10,000	10,000	10,000	10,000	0.95	0.95	0.95	0.95				
		Greenbriar	Shepard	0.4		700		15,000	15,000	15,000	15,000	1.99	1.99	1.99	1.99				
		Shepard	Dunlavy	1.6		2,700		13,000	13,000	13,000	13,000	6.65	6.65	6.65	6.65				
		Dunlavy	Montrose	2.15		3,600		15,000	15,000	15,000	15,000	10.23	10.23	10.23	10.23				
	Wheeler	SW Freeway	Almeda	0.7		1,200		14,000	14,000	14,000	14,000	3.18	3.18	3.18	3.18				
		Almeda	South Freeway	0.15		300		14,000	14,000	14,000	14,000	0.80	0.80	0.80	0.80				
	Blodget	Fannin	Almeda	1.1		1,900		20,000	20,000	20,000	20,000	7.20	7.20	7.20	7.20				
		Almeda	South Freeway	0.35		600		20,000	20,000	20,000	20,000	2.27	2.27	2.27	2.27				
	Southmore	Fannin	Almeda	1.5		2,500		7,000	7,000	7,000	7,000	3.31	3.31	3.31	3.31				
	Binz	Fanning	Almeda	1		1,700		10,000	10,000	10,000	10,000	3.22	3.22	3.22	3.22				
	Hermann	Montrose	Almeda	0.6	2.1	1,000	3,500	13,000	13,000	13,000	13,000	2.46	2.46	2.46	2.46	8.62	8.62	8.62	8.62
		Almeda	South Freeway	0.15	0.15	300	300	13,000	13,000	13,000	13,000	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
	Rice	Kirby	Greenbriar	0.05		100		11,000	11,000	11,000	11,000	0.21	0.21	0.21	0.21				
		Greenbriar	Shepard	0.7		1,200		13,000	13,000	13,000	13,000	2.95	2.95	2.95	2.95				
		Shepard	Sunset	1.6		2,700		16,000	16,000	10,000	10,000	8.18	8.18	5.11	5.11				
	Sunset	Rice	Main	0.8		1,400		15,000	15,000	15,000	15,000	3.98	3.98	3.98	3.98				
	University	Kirby	Greenbriar	0.4		700		8,000	8,000	8,000	8,000	1.06	1.06	1.06	1.06				
		Greenbriar	Main	2		3,400		15,000	15,000	15,000	15,000	9.66	9.66	9.66	9.66				
	Holcombe	Kirby	Greenbriar	0.15		300		39,000	31,000	31,000	31,000	2.22	1.76	1.76	1.76				
		Greenbriar	Main	0.35		600		42,000	36,000	36,000	23,000	4.77	4.09	4.09	2.61				
		Braeswood	Cambridge	0.4		700		37,000	34,000	28,000	40,000	4.91	4.51	3.71	5.30				
		Cambridge	Almeda	0.3	0.9	500	1,500	43,000	34,000	34,000	40,000	4.07	3.22	3.22	3.79	12.22	9.66	9.66	11.36

	Braeswood	Kirby	Main		1.1		1,900	21,000	29,000	37,000	29,000					7.56	10.44	13.31	10.44
		Main	Greenbriar		0.4		700	25,000	22,000	22,000	26,000					3.31	2.92	2.92	3.45
		Greenbriar	Fannin	0.5		800		26,000	26,000	30,000	26,000	3.94	3.94	4.55	3.94				
	Macgregor	Holcombe	Macgregor'		0.8		1,400	42,000	32,000	32,000	38,000					11.14	8.48	8.48	10.08
		Macgregor'	Almeda		2.4		4,100	39,000	37,000	37,000	43,000					30.28	28.73	28.73	33.39
		Almeda	South Freeway	0.25		400		41,000	39,000	39,000	39,000	3.11	2.95	2.95	2.95				
	Old Spanish	Kirby	North Stadium	0.75		1,300		37,000	24,000	24,000	32,000	9.11	5.91	5.91	7.88				
		Cecil	Cambridge	0.2		300		30,000	26,000	26,000	26,000	1.70	1.48	1.48	1.48				
		Cambridge	Almeda	0.95		1,600		28,000	24,000	24,000	24,000	8.48	7.27	7.27	7.27				
		Almeda	Yellowstone	0.1		200		28,000	24,000	24,000	24,000	1.06	0.91	0.91	0.91				
	Hollyhall	Fannin	Knight	0.55		900		10,000	10,000	10,000	6,000	1.70	1.70	1.70	1.02				
		Knight	Cambridge	0.8		1,400		18,000	18,000	14,000	18,000	4.77	4.77	3.71	4.77				
		Cambridge	Almeda	0.7		1,200		20,000	20,000	16,000	20,000	4.55	4.55	3.64	4.55				
		El Rio	El Camino	1.35		2,300		10,000	10,000	14,000	7,000	4.36	4.36	6.10	3.05				
		El Camino	South Freeway	0.5		800		10,000	10,000	20,000	7,000	1.52	1.52	3.03	1.06				
B. Proposed Thoroughfares and Major Collectors																			
N-S	Macgregor'	Macgregor	Fannin		2		3,400	28,000	23,000	23,000	23,000					18.03	14.81	14.81	14.81
		Holcombe	Macgregor		0.1		200		12,000								0.45		
	Cambridge	Old Spanish	Holcombe	1.7		2,900			19,000				10.44						
	Grand	Old Spanish	Holcombe	0.5		800				8,000				1.21					
		Holcombe	Dixie	0.2		300				5,000				0.28					
		Dixie	South Freeway	0.1		200				5,000				0.19					
	El Rio	South Loop	Hollyhall	0.3		500				4,000				0.38					
	Knight	Hollyhall	El Paseo	0.9		1,500		20,000	28,000	27,000	25,000	5.68	7.95	7.67	7.10				
		El Paseo	Cecil	0.1		200		30,000	38,000	35,000	25,000	1.14	1.44	1.33	0.95				
	Cecil	Old Spanish	Braeswood	0.2		300		19,000	19,000	28,000	21,000	1.08	1.08	1.59	1.19				
	Travis	Holcombe	University	1.4		2,400				5,000				2.27					
	Connector	Old Spanish	Braeswood	0.65		1,100				16,000				3.33					
E-W	Dixie	Braeswood	Almeda		0.5		800			12,000								1.82	
		Almeda	Grand	0.4		700				7,000				0.93					
	La Concha	South Loop	Murworth	0.9		1,500				5,000				1.42					
		Cambridge	Almeda	0.55		900				6,000				1.02					
	Murthworth	Main	La Concha	0.3		500			5,000	5,000	5,000		0.47	0.47	0.47				
	El Paseo	Knight	Cambridge	0.95		1,600				8,000				2.42					
		Cambridge	Almeda	0.65		1,100				8,000				1.67					

TOTALS			98,300	30,900
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334	323	317	303	162	151	160	164
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Notes:

- * The length of roadway next to residential/park areas was measured from the existing "TMC Master Plan - Land Use Map" provided by the City of Houston.
- ** Existing and Future Traffic Volumes were provided by the Texas Transportation Institute (volume maps).

APPENDIX F: COST ESTIMATES
COMMON TO ALL STRATEGIES

Project No.	Project Description	Total Cost
1	Build US 59 northbound Main Street exit	\$4,050,000
2	Speed control/pedestrian safety on Greenbriar/Shepherd	\$1,100,000
3	Golf Course Way – one-way southbound	\$700,000
4	288 merged lanes	\$77,500,000
5	Capacity enhancement of Holly Hall eastbound to SH 288 and IH-610	\$2,500,000
6	Re-align MacGregor closer to bayou	\$9,350,000
7	People mover on Bernier extension	\$20,900,000
Total cost for projects common to all strategies		\$116,100,000

STRATEGY 1 – Transportation Network Improvements

Project No.	Project Description	Total Cost
1	Widen Holcombe to eight lanes – Main to Braeswood	\$6,400,000
2	Cambridge extension and improvement	\$13,250,000
3	Braeswood to OST connection	\$1,300,000
4	Continuous frontage roads at IH-610/SH 288 interchange	\$55,650,000
5	Various intersection improvements (Approx. 20 intersections)	\$5,000,000
Total Cost for Strategy 1 Without Common Projects		\$81,600,000

STRATEGY 2 – System Connectivity

Project No.	Project Description	Total Cost
1	Extend Ennis to Ardmore	\$4,050,000
2	Extend Dixie to MacGregor	\$4,700,000
3	Holcombe to North Macgregor	\$2,400,000
4	Extension of South Braeswood to Holcombe	\$6,500,000
5	Extend Travis to Holcombe	\$2,700,000
6	Improve Greenbriar from Rice to Main to four-lanes	\$4,500,000
7	Extend Bertner south to proposed Bio Tech Park	\$7,350,000
8	Braeswood to OST connection	\$1,300,000
9	Extend La Concha to 610 and Cambridge	\$20,350,000
10	Extend Grand to OST	\$2,600,000
11	Connect Grand to El Camino	\$6,500,000
12	Extend El Camino to Alameda	\$2,450,000
13	Continuous frontage roads at IH-610/SH 288 interchange	\$55,650,000
14	Direct connection between 610 eastbound frontage road and east bound main lane	\$6,850,000
15	Extend Knight and Cambridge under raised IH-610	\$87,850,000
16	Extend West Bellfort from Buffalo Speedway to Stella Link	\$4,400,000
17	Direct Access to Astrodome parking via flyover	\$7,250,000
18	Various intersection improvements (approximately 10 intersections)	\$2,500,000
Total Cost for Strategy 2 Without Common Projects		\$229,900,000

STRATEGY 3 – Operational Improvements

Project No.	Project Description	Total Cost
1	Widen Holcombe to eight lanes – Main to Braeswood	\$6,400,000
2	Holcombe-Galen/Pressler one-way pair	\$6,100,000
3	Dixie reversible between Alameda and SH 288	\$2,700,000
4	Reversible lanes on McNee	\$950,000
5	Reversible lanes on Murworth	\$1,450,000
6	Proposed managed lanes on IH-610	\$54,900,000
7	Various intersection improvements (Approximately 60 intersections)	\$15,000,000
Total Cost for Strategy 3 Without Common Projects		\$87,500,000